

AEROSPACE MEDICINE AND BIOLOGY

P-41

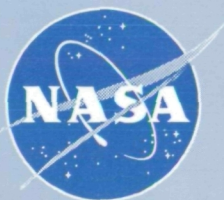
A CONTINUING BIBLIOGRAPHY WITH INDEXES

(NASA-SP-7011(398)) AEROSPACE
MEDICINE AND BIOLOGY: A CONTINUING
BIBLIOGRAPHY WITH INDEXES
(SUPPLEMENT 398) (NASA) 41 p

N95-19239

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NASA SP-7011 (398)
February 1995

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES



National Aeronautics and Space Administration
Scientific and Technical Information Office
Washington, DC

1995

This publication was prepared by the NASA Center for AeroSpace Information,
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INTRODUCTION

This issue of *Aerospace Medicine and Biology* (NASA SP-7011) lists 66 reports, articles, and other documents recently announced in the NASA STI Database. The first issue of *Aerospace Medicine and Biology* was published in July 1964.

Accession numbers cited in this issue include:

Scientific and Technical Aerospace Reports (STAR) (N-10000 Series)

Open Literature (A-60000 Series)

N95-11698 — N95-13609

A95-60780 — A95-61679

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which humans are subjected during and following simulated or actual flight in the Earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. Applied research receives the most emphasis, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the publication consists of a standard bibliographic citation accompanied, in most cases, by an abstract. The listing of the entries is arranged by *STAR* categories 51 through 55, the Life Sciences division. The citations include the original accession numbers from the NASA STI Database.

Seven indexes—subject, personal author, corporate source, foreign technology, contract number, report number, and accession number—are included.

A cumulative index for 1995 will be published in early 1996.

The NASA CASI price code table, addresses of organizations, and document availability information are located at the back of this issue.

TABLE OF CONTENTS

Category 51	Life Sciences (General)	27
Category 52	Aerospace Medicine Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.	31
Category 53	Behavioral Sciences Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.	34
Category 54	Man/System Technology and Life Support Includes human engineering; biotechnology; and space suits and protective clothing.	36
Category 55	Space Biology Includes exobiology; planetary biology; and extraterrestrial life.	39

Subject Index	A-1
Personal Author Index	B-1
Corporate Source Index	C-1
Foreign Technology Index.....	D-1
Contract Number Index	E-1
Report Number Index	F-1
Accession Number Index	G-1
Appendix	APP-1

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ON MICROFICHE

This paper reports the results of a pilot study in which a 240-gram rat was implanted for 41 days with biotelemetry devices weighing a total of 36 gm (18 cc). The implanted animal showed no differences in weight gain, food and water consumption, and postnecropsy organ weights when compared to both an unoperated control animal and an animal that underwent surgery but did not receive an implant. The implanted animal also had temperature and activity rhythms similar to those reported using much smaller implants. Thus, this pilot study showed that a 240-gm rat could be implanted with biotelemetry devices weighing nearly 15 percent of body weight without significant changes in health or behavior. A larger study involving more animals and similar implant sizes is recommended.

ACCESSION NUMBER	→	A95-60650	
TITLE	→	BASIC ASSUMPTIONS AND COMPARISON OF THREE GRAVITROPIC RESPONSE MODELS	
AUTHOR	→	A. STOCKUS Inst. of Botany, Vilnius, Lithuania	Advances in ← AUTHORS' AFFILIATION
JOURNAL TITLE	→	Space Research (ISSN 0273-1177) vol. 14, no. 8 August 1994	← PUBLICATION DATE
		p. (8)145-(8)148 Life sciences and space research 25 (1). Gravitational biology; Interdisciplinary Scientific Commission F of the COSPAR Plenary Meeting, 29th, Wash., DC, Aug. 28-Sep. 5, 1992	
REPORT NUMBER	→	(ISBN 0-08-042485-6) Copyright	

vi

AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 398)

February 1995

51

LIFE SCIENCES (GENERAL)

A95-60859

COMPETITION IN THE CHEMOSTAT: GLOBAL ASYMPTOTIC BEHAVIOR OF A MODEL WITH DELAYED RESPONSE IN GROWTH

S. F. ELLERMEYER Worcester Polytechnic Inst., MA SIAM Journal on Applied Mathematics (ISSN 0036-1399) vol. 54, no. 2 April 1994 p. 456-465 refs (BTN-94-EIX94341340323) Copyright

The asymptotic behavior of solutions of a model for competition between two microorganisms in the chemostat is studied. The model incorporates time delays that allow for the cellular components of each competing species to be structured to include unassimilated or 'stored' nutrient. Sufficient conditions on the parameters of the model that guarantee (i) competitive exclusion and (ii) persistence of at least one of the competing organisms are determined. The results extend earlier results on the corresponding model for a single species and also extend these to include competition. EI

A95-60860

PARTICLE METHOD FOR POPULATION WAVES

CHICHIA CHIU Michigan State Univ., East Lansing, MI and FRANK C. HOPPENSTEADT SIAM Journal on Applied Mathematics (ISSN 0036-1399) vol. 54, no. 2 April 1994 p. 466-477 (BTN-94-EIX94341340324) Copyright

Phase models are useful for studying synchronization of bacterial cell culture growth and other biological events associated with cell cycles. This paper considers a model that allows the growth rate of cells to change at phases of cell cycle. In this paper, a particle method is derived for solving the weak formulation of this model, convergence of the particle method is proved. EI

A95-60861

INHIBITION-PRODUCED PATTERNING IN CHAINS OF COUPLED NONLINEAR OSCILLATORS

G. B. ERMENTROUT Pittsburgh Univ., PA and N. KOPELL SIAM Journal on Applied Mathematics (ISSN 0036-1399) vol. 54, no. 2 April 1994 p. 478-507 refs (BTN-94-EIX94341340325) Copyright

This paper describes the behavior of chains of oscillators in the which there is both local coupling and coupling between points on the chain that are roughly a distance of a half-chain apart. The investigation is motivated by data concerning traveling waves of electrical activity in the nervous system of animals that swim in an undulatory manner and also by observations concerning the motor behavior of more general vertebrates in early development. The aim of the work is to show that this connectivity can give rise to waves with wavelength equal to the length of the chain as observed in swimming animals, as well as the more complicated patterns seen in early development. EI

A95-61564

MAMMALIAN CELL CULTIVATION IN SPACE

MEIFU FENG Chinese Academy of Sciences, Beijing, China,

JIANXIA PENG Chinese Academy of Sciences, Beijing, China, CHANGCHENG SONG Chinese Academy of Sciences, Beijing, China, and YOUNG WANG Chinese Academy of Sciences, Beijing, China Microgravity Science and Technology (ISSN 0938-0108) vol. 7, no. 2 July 1994 p. 207-210 International Symposium on Microgravity Science and Application (ISMSA), Beijing, China, May 10-13, 1993. Copyright

In order to study the effect of microgravity on mammalian cell growth, proliferation and biosynthesis, the human T leukemia cells, human lung adenocarcinoma cells, EVI-HI hybridoma cells and genetic engineering cells producing human growth hormone were flown on re-entry Scientific Satellite 90105 for a duration of eight days. The preliminary results indicate that the mammalian cells are sensitive to gravity. They might adapt to microgravity conditions leading to altered growth rate and subsequently, to altered biosynthesis and molecular secretion. In addition their morphology may be affected in microgravity. Author (Herner)

N95-11728# Marci (J. M.) Spectroscopic Society, Prague, Stredocesky (Czechoslovakia).

ABSTRACTS FROM THE INTERNATIONAL CONFERENCE ON NUCLEAR ANALYTICAL METHODS IN THE LIFE SCIENCES Abstracts Only

31 Jan. 1994 210 p Conference held in Prague, Czechoslovakia, 13-17 Sep. 1993 (DE94-621923; INIS-MF-13811; CONF-930954) Avail: CASI HC A10/MF A03 (US Sales Only)

The proceedings contain short communications of 133 papers presented at the conference. All these contributions have been inputted to international nuclear information system (INIS). The majority of papers deal with the determination of trace elements in biological and environmental samples using neutron activation analysis, X-ray fluorescence analysis, proton-induced X-ray emission (PIXE) analysis and tracer techniques. DOE

N95-11737# Rensselaer Polytechnic Inst., Troy, NY.

MICROBIAL COMMUNITIES IN SUBSURFACE ENVIRONMENTS: DIVERSITY, ORIGIN, AND EVOLUTION

S. A. NIERZWICKI-BAUER 2 May 1994 10 p (Contract(s)/Grant(s): DE-FG02-90ER-60989) (DE94-013699; DOE/ER-60989/4) Avail: CASI HC A02/MF A01

This report summarizes the progress made from 9-1-93 to 5-1-94 on this DOE grant. As participants in the subsurface science program, the authors are assessing the influence of environmental conditions on the distribution and evolution of subsurface microorganisms employing molecular techniques. The approach utilizes 16S rRNA targeted oligonucleotide probes, polymerase chain reaction (PCR) amplification of gene sequences, and sequencing techniques. Continued progress towards identifying target sequences for selected microbial types and groups is being made by analysis of rRNA sequence data for subsurface microorganisms and other microorganisms in the rRNA databases. Hybridization probes for these target sequences are being produced and used to classify isolated strains of subsurface microbes into focus clades useful for testing origins hypotheses. DOE

N95-11810* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
EFFECTS OF ORAL GLUCOSE ON EXERCISE THERMOREGULATION IN MEN AFTER WATER IMMERSION
 ALAN S. DEARBORN (San Francisco Univ., CA.), ANDREW C. ERTL (California Univ., Davis, CA.), JOHN E. GREENLEAF, PAUL R. BARNES, CATHERINE G. R. JACKSON, and JENNIFER L. BRECKLER Aug. 1994 34 p
 (Contract(s)/Grant(s): RTOP 199-18-12-07)
 (NASA-TM-108825; A-94085; NAS 1.15:108825) Avail: CASI HC A03/MF A01

To test the hypothesis elevated blood glucose would attenuate the rise in exercise rectal temperature, six men age 35 plus or minus S.D. 7 years participated in each of three trials by 4-hr water immersion to the neck: (1) 2.0 g/kg body wt of oral glucose (33.8 percent wt./vol.) was consumed followed by 80 min controlled rest (Glu/Rest), and 70 min horizontal supine cycle exercise at 62.8 percent plus or minus S.E. 0.5 percent (1.97 plus or minus 0.02 L/min) of peak O₂ uptake followed by 10 min recovery (2) with (Glu/Ex) and (3) without prior glucose (No Glu/Ex). Blood samples were taken at -25, 0, 15, 45, and 68 min of exercise and after plus 10 min of recovery for measurement of hemoglobin, hematocrit, and blood glucose. Both mean skin (T sub sk) (from six sites) and rectal temperatures (T sub re) were monitored continuously. Sweat rate was measured by resistance hygrometry. The mean of delta PV for the exercise trials was -12.2 plus or minus 2.1 percent. Mean blood glucose for the Glu/Ex trial was higher than that of the No Glu/Ex trial was (108.4 equal or minus 3.9 and 85.6 plus or minus 1.6 mg/dl, respectively, P less than 0.05. At the end of exercise T(sub sk) for the Glu/Ex trial was lower than for No Glu/Ex (32.0 plus or minus 0.3 and 32.4 equals or minus 0.2 C, respectively, P less than 0.05); T(sub re) for the Glu/Ex trial was lower than for No Glu/Es (38.22 plus or minus 0.17 and 38.60 plus or minus 0.11 C, respectively, P less than 0.05); and forearm sweat rate for the Glu/Ex trial (0.34 plus or minus 0.04 and 0.43 plus or minus g/sq cm, respectively, P less than 0.05). These data suggest that elevation of blood glucose prior to horizontal exercise following hypohydration attenuates the increase in body temperature without altering heat production or exercise hypovolemia. Author

N95-11902# Technische Univ., Delft (Netherlands). Interfaculty Reactor Inst.
COPPER METABOLISM IN RATS FED ASCORBIC ACID OR RESTRICTED AMOUNTS OF COPPER Ph.D. Thesis
[KOPERHUISHOUDING BIJ RATTEN NA VERSTREKKING VAN ASCORBINEZUUR-RIJKE OF KOPER-ARME VOEDERS]
 G. J. VANDENBERG 25 Nov. 1993 156 p
 (PB94-191343; ISBN-90-73861-18-7) Avail: CASI HC A08/MF A02

The effects of feeding supplements of ascorbic acid on dietary copper availability and copper status were studied in rats. Male outbred Wistar (Hsd/Cpb:Wu) rats used were fed on purified diets adequate in copper (5 mg/kg) without or with 1 or 10 g ascorbic acid/kg diet. In Chapters 1 and 2 the mechanisms are described by which dietary ascorbic acid influences copper metabolisms; the effects of a very high concentration (10 g ascorbic acid/kg diet) are compared with those of a pharmacological one (1 g/kg diet). The third Chapter describes a whole-body counting technique and the use of radiotracers which allow determination of true copper absorption in vivo. Chapter 4 describes the influence of ascorbic acid on true copper absorption and biliary excretion. Chapter 6 deals with the effects of ascorbic acid on intestinal copper solubility. A model for copper uptake is proposed in which reducing agents, ascorbic acid or a membrane bound NADH reductase, are involved (Chapter 9). Finally, in the general discussion the results presented are summarized and integrated. NTIS

N95-11966* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
ON THE ISOLATION OF HALOPHILIC MICROORGANISMS FROM SALT DEPOSITS OF GREAT GEOLOGICAL AGE
 HELGA STAN-LOTTER and EWALD DENNER In its Technical Paper Contest for Women 1992. Space Challenges: Earth and Beyond p 137-144 1993

Avail: CASI HC A02/MF A03

From salt sediments of Triassic or Permian age from various locations in the world halophilic microorganisms were isolated. Molecular characteristics of several of the isolates suggested they belong to the archaeobacteria. One group appears to represent novel strains; several properties of one such isolate, strain Blp, are described here. The existence of viable microorganisms in ancient sediment would have great implications with respect to our notions on evolution, the research for life in extraterrestrial environments, and the longterm survival of functional biological structures. Of crucial importance is thus the question if these microorganisms existed in the salt since the time of deposition or invaded at some later date. Some suggestions to address these issues experimentally are discussed. Author

N95-12006* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
VESTIBULAR AFFERENT RESPONSES TO LINEAR ACCELERATIONS IN THE ALERT SQUIRREL MONKEY
 CHRISTOPHER J. SOMPS, ROBERT H. SCHOR, and DAVID L. TOMKO Aug. 1994 18 p
 (Contract(s)/Grant(s): RTOP 199-16-12)
 (NASA-TM-4581; A-94058; NAS 1.15:4581) Avail: CASI HC A03/MF A01

The spontaneous activity of 40 otolith afferents and 44 canal afferents was recorded in 4 alert, intact squirrel monkeys. Polarization vectors and response properties of otolith afferents were determined during static re-orientations relative to gravity and during Earth-horizontal, sinusoidal, linear oscillations. Canal afferents were tested for sensitivity to linear accelerations. For regular otolith afferents, a significant correlation between upright discharge rate and sensitivity to dynamic acceleration in the horizontal plane was observed. This correlation was not present in irregular units. The sensitivity of otolith afferents to both static tilts and dynamic linear acceleration was much greater in irregularly discharging units than in regularly discharging units. The spontaneous activity and static and dynamic response properties of regularly discharging otolith afferents were similar to those reported in barbiturate-anesthetized squirrel monkeys. Irregular afferents also had similar dynamic response properties when compared to anesthetized monkeys. However, this sample of irregular afferents in alert animals had higher resting discharge rates and greater sensitivity to static tilts. The majority of otolith polarization vectors were oriented near the horizontal in the plane of the utricular maculae; however, directions of maximum sensitivity were different during dynamic and static testing. Canal afferents were not sensitive to static tilts or linear oscillations of the head. Author

N95-12310 National Academy of Sciences - National Research Council, Washington, DC. Committee on National Needs for Biomedical and Behavioral Research Personnel.
MEETING THE NATION'S NEEDS FOR BIOMEDICAL AND BEHAVIORAL SCIENTISTS
 1994 166 p
 (LC-94-66477; ISBN-0-309-05086-3) Copyright Avail: Issuing Activity

The subject of this report is the nation's future need for biomedical and behavioral research scientists and the role the National Research Service Awards (NRSA) program can play in meeting those needs. This is the tenth in the continuing series of reports to the National Institutes of Health (NIH) and the U.S. Congress on this subject. The committee's deliberations and recommendations centered on three major activities. First, a Panel on Estimation Procedures was established to provide numerical analysis of educational and employment prospects and national needs for biomedical and behavioral research personnel. The panel concluded that existing mathematical models are inadequate to predict need and their recommendations for alternative strategies are presented in Chapter 2. Second, the committee convened a public hearing to gather views from a broad constituency associated with NRSA programs. Both written and oral testimony were considered by the committee and their conclusions are reflected in the recommendations stated within the report. Third, the committee met as a group on four separate occasions and, as a panel of experts, discussed

and debated information and recommendations. The consensus of these meetings forms the basis for the recommendations included in this report. Author (revised)

N95-12393# Puerto Rico Univ., San Juan. Inst. of Neurobiology. **NEURAL NETWORKS: STRUCTURE AND REPAIR. PART 1: GROUND SQUIRREL VISUAL SYSTEM. PART 2: FORMATION, MAINTENANCE AND PLASTICITY OF SYNAPTIC CONNECTIONS** Progress Report, 1993 - 1994 NIDZA LUGO-GARCIA, DAMIEN P. KUFFLER, and ROSA E. BLANCO 27 Jul. 1994 4 p
(Contract(s)/Grant(s): N00014-89-J-3070)
(AD-A282420) Avail: CASI HC A01/MF A01

This project uses the visual system of squirrels, with special emphasis on the retina, to study the normal organization of neural networks. Over the past year we have added to our knowledge of the organization of the retinal ganglion cell layer: (1) We have determined that only 50% of the cells in the ganglion cell layer are retinal ganglion cells. (2) Retinal ganglion cells projecting to the superior colliculus have been identified using Cholera Toxin subunit B (CTB) as a retrograde tracer. The ZIDAS and Neurolucida image analysis systems have been used to characterize the dendritic tree of the medium-sized cells from this group. Differences in the organization of the dendritic tree suggest that these cells comprise more than one subpopulation. (3) Experiments to determine whether retinal ganglion cells project to more than one retinal projection target have revealed that ganglion cells in this species do not project bilaterally to any significant degree. DTIC

N95-12614 Edgewood Research Development and Engineering Center, Aberdeen Proving Ground, MD. **ACUTE INHALATION OF EXPLOSIVELY DISSEMINATED CARBON FIBERS IN RATS** Final Report, Nov. 1991 - Apr. 1992

ROGER J. HILASKI, JEFFREY D. BERGMANN, DAVID C. BURNETT, WILLIAM T. MUSE, JR., and SANDRA A. THOMSON May 1994 111 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract(s)/Grant(s): DA PROJ. 1C4-63627-DE-79)
(AD-A280556; ERDEC-TR-084) Avail: CASI HC A06

Carbon fibers are lightweight, high tensile strength synthetic strands used commercially and in military applications for aircraft and electromagnetic obscuration. Fibers with respirable diameters less than 3.5 micrometers and lengths greater than 10 micrometers will deposit by interception in the bronchi. Recent XM81 grenade field studies indicated that explosive dissemination produced fibers with diameters less than 3.0 micrometers and lengths less than 100 micrometers, making some of the fibrous smoke respirable. Carbon fibers were explosively generated to determine if the resultant aerosol is respirable and if it adversely affects rodents. Groups of 344 male Fischer rats were exposed to one of the three concentrations of carbon fibers for 30 min. Air-exposed and fuse/fuelexposed rats served as the controls. Exposed rats and respective control groups were submitted for bronchoalveolar lavage; biochemical, physiological, and pathological evaluation at 24 hr and 14 and 90 days post exposure. Also, SEM analysis was used to characterize the size range of the fibers and to determine fiber deposition in trachea and lung tissues. Aerosol samples were collected for mutagenicity testing. Initial results indicated the presence of fiber fragments and combustion products in the respirable range. However, there were no adverse changes in the biological responses of the rats from short-term exposure to XM81 grenade aerosols. DTIC

N95-12677# Pacific Northwest Lab., Richland, WA. **RATIONAL ENZYME REDESIGN**

R. L. ORNSTEIN May 1994 5 p Presented at the LIGNIN Workshop on Research Needs in LIGNIN Biosynthesis and Biodegradation, Pacific Grove, CA, 25-26 May 1994
(Contract(s)/Grant(s): DE-AC06-76RL-01830)

(DE94-014565; PNL-SA-24337; CONF-9405190-1) Avail: CASI HC A01/MF A01

Protein engineering is first a means of elucidating structure-function relations in an enzyme, and second, a means of changing a protein to make it serve a different, but generally related, purpose. In principle, one may change the functional characteristics of an enzyme by altering its substrate specificity, kinetics, optimum range of activity, and chemical mechanism. Obviously one cannot make all possible combinations of amino acid changes for even the smallest enzyme, so the essential question is which changes to make. The intent of rational protein/enzyme redesign is to alter a protein/enzyme in a timely and premeditated fashion. This article provides an outline of the process of rational enzyme redesign. DOE

N95-12827*# Emory Univ., Atlanta, GA. Dept. of Physiology. **EFFECT OF DECREASED GRAVITY ON CIRCULATION IN THE RAT** Final Technical Report, 1 May 1985 - 31 Jan. 1987 VOJIN P. POPOVIC 1 Jul. 1987 92 p
(Contract(s)/Grant(s): NAG2-87)
(NASA-CR-196946; NAS 1.26:196946) Avail: CASI HC A05/MF A01

It has been reported that hypokinesia and bed rest induce cardiovascular changes similar to those observed in space flights. Using an animal model that was developed in our laboratory and that was extensively studied and characterized in our laboratory and other laboratories in this country and abroad, we have studied circulatory mechanisms that occur during exposure to hypokinesia (with or without negative tilt) as well as during readaptation to control conditions (free activity). We believe that this study contributes to better understanding of mammalian circulatory mechanisms that operate under 1-g force and will serve to provide control data to be compared with cardiovascular data obtained in conditions of a Space lab. Because surgery and anesthesia drastically decrease cardiac output and other circulatory parameters in rats, only unanesthetized rats were used in experiments. Aorta and right atrium of the animals were permanently cannulated fifteen to twenty days before experiments. Arterial and right ventricular blood pressures, cardiac output, cerebral and other regional blood flow, ECG, other cardiovascular parameters, and oxygen consumption were measured with techniques routinely used in our laboratory. Specifically, we undertook the following investigations during the period of three years: (1) A study of circulatory changes (right ventricular pressure, arterial blood pressure, heart rate, cardiac output) during exposure of rats to hypokinetic conditions. Used the head down tilted Holton-Musacchia system in order to compare the results with the results already obtained on unrestrained rats, (2) Humoral changes were investigated in animals exposed to hypokinesia; also, lymphocyte and neutrophil levels in hypokinetic animals (with or without tilt) were determined to ascertain the level of induced stress and possible changes observed in weightless animals, and (3) circulating blood volume was determined during and after hypokinesia. Author

N95-12941*# Louisville Univ., KY. Dept. of Microbiology and Immunology.

SPACEFLIGHT AND IMMUNE RESPONSES OF RHESUS MONKEYS Final Report

GERALD SONNENFELD Sep. 1994 14 p
(Contract(s)/Grant(s): NAG2-624)
(NASA-CR-196846; NAS 1.26:196846) Avail: CASI HC A03/MF A01

Evidence from both human and rodent studies indicates that alterations in immunological parameters occur after space flight. The objective of this project is to determine the effects of space flight on immune responses of Rhesus monkeys. The expected significance of the work is a determination of the range of immunological functions of the Rhesus monkey, a primate similar in many ways to man, affected by space flight. Changes in immune responses that could yield alterations in resistance to infection may be determined as well as the duration of alterations in immune responses.

51 LIFE SCIENCES (GENERAL)

Additional information on the nature of cellular interactions for the generation of immune responses may also be obtained.

Derived from text

N95-13176# California Univ., Davis, CA. Primate Research Center.

CONSEQUENCES OF PROLONGED INHALATION OF OZONE ON FISCHER-344/N RATS: COLLABORATIVE STUDIES. PART 1: CONTENT AND CROSS-LINKING OF LUNG COLLAGEN
J. A. LAST, T. R. GELZLEICHTER, J. HARKEMA, and S. HAWK
Apr. 1994 50 p Prepared in cooperation with Lovelace Biomedical and Environmental Research Inst., Albuquerque, NM and Inhalation Toxicology Research Inst., Albuquerque, NM
(Contract(s)/Grant(s): RFA-90-1)
(PB94-182748; HEI/RR-65-1/94-PT-1) Copyright Avail: CASI HC A03/MF A01

Male and female rats were exposed either to filtered air (controls) or to 0.12, 0.5, or 1.0 parts per million ozone for six hours per day, five days per week, for 20 months. Biochemical analysis indicated excess collagen in the female rats exposed to 0.5 to 1.0 ppm ozone. Collagen in the lungs of the females also contained relatively more hydroxylysine-derived cross links than did the lung collagen from age-matched control animals that had breathed only filtered air. Exposure of Fischer-344 rats for 20 months to 0.5 or 1.0 ppm ozone was associated with excess fibrotic lung collagen deposition as defined histologically. The authors conclude that chronic exposure of rats to 20 months to ozone at concentrations of 0.5 ppm or above for six hours per day, five days per week, causes mild to moderate lung fibrosis, as defined histologically and, in female rats, biochemically. The significance of these observations with regard to health risks to humans chronically inhaling ozone at ambient levels in polluted air remains to be determined. DTIC

N95-13271# Ohio State Univ., Columbus.
REGULATION OF ALTERNATIVE CO₂ FIXATION PATHWAYS IN PROKARYOTIC AND EUKARYOTIC PHOTOSYNTHETIC ORGANISMS

R. TABITA 1993 12 p
(Contract(s)/Grant(s): DE-FG02-91ER-20033)
(DE94-013180; DOE/ER-20033/2) Avail: CASI HC A03/MF A01

The goal of this project is to determine how photosynthetic microorganisms regulate the assimilation of CO₂ via pathways alternative to the usual Calvin-Benson-Bassham reductive pentose phosphate scheme, particularly in the molecular basis for switches in CO₂ metabolic paths. We have identified proteins on one-dimensional and two-dimensional SDS gels that appear differentially expressed in *R. sphaeroides* strain 16PHC which may be due to a mutation or change in some locus that controls the expression of several genes and their products. Similar observations were made relative to *R. rubrum* I-19 and the wild-type, namely that additional protein bands were observed in extracts of I-19 compared to the wild-type when both were grown photoheterotrophically with malate as electron donor and CO₂ as the obligatory electron acceptor. The results of Tn5 mutagenesis of *R. sphaeroides* 16PHC resulted in the isolation of several strains that effectively changed back to the 16 phenotype; i.e., no malate-dependent phototrophic growth with CO₂ as electron acceptor. We have found that both wild-type *R. sphaeroides* and *R. rubrum*, and the respective RubisCO negative mutant strains, are all capable of photolithoautotrophic growth using reduced sulfur compounds as electron donors and CO₂ as the sole carbon source and electron acceptor. The fact that the RubisCO negative are capable of photoautotrophic growth is an exciting development for us because it proves that alternative or nonCalvin CO₂ fixation pathways are extremely important to the overall carbon metabolism of these organisms. Moreover, wild-type strains turn off the synthesis of RubisCO under these cultural conditions. Thus, there appears to be separate autotrophic CO₂ fixation pathways in these organisms, and a major emphasis has

been placed to identify how these bacteria can grow autotrophically and fix CO₂ in the absence of RubisCO. DOE

N95-13373# Brandeis Univ., Waltham, MA.

CONFORMATION OF MEMBRANE PROTEINS:

BACTERIORHODOPSIN Final Report, 1 Nov. 1992 - 15 Apr. 1994

GERALD D. FASMAN 13 May 1994 6 p

(Contract(s)/Grant(s): DAAH04-93-G-0007)

(AD-A281282; ARO-29714.1-LS) Avail: CASI HC A02/MF A01

Bacteriorhodopsin, from the purple membrane (PM) of *Halobacterium halobium*, was chemically modified with methoxypolyethylene glycol (MW = 5000) succinimidyl carbonate. The polyethylene glycolbacteriorhodopsin (m-PEG-SC-BR33) conjugate, containing one PEG chain, was water soluble. The secondary structure of the conjugate in water appeared partially denatured but was shown to contain α -helical segments by circular dichroism (CD) spectroscopy. The isolated bacteriorhodopsin conjugate, with added retinal, was refolded in a mixed detergent-lipid micelle and had an absorption maximum at 555 nm. The refolded conjugate was transferred into vesicles which pumped protons, upon illumination, as efficiently as did native BR. Modification of the PM with methoxypolyethylene glycol did not alter the native structure or inhibit proton pumping, and therefore it is suggested that the glycol polymer is present as a covalently linked moiety to residues unnecessary for proton pumping and proper folding. The site of attachment of mPEG was determined to be either at Lys 129 or Lys 159, with position Lys 129 the most probable site of attachment. The m-PEG-SC-BR33 could be stepwise refolded to the native conformation by the addition of trifluoroethanol to lower the dielectric constant, simulating the insertion of the BR into the phospholipid bilayer.

DTIC

N95-13408# Technische Univ., Delft (Netherlands).

MODELLING OF BIOPOTENTIAL RECORDINGS AND ITS IMPLICATIONS FOR INSTRUMENTATION DESIGN Ph.D.

Thesis

A. C. M. VANRIJN 8 Nov. 1993 153 p Sponsored by Stichting voor de Technische Wetenschappen

(PB94-206844) Avail: CASI HC A08/MF A02

The thesis describes the results of a five year research project where the measurement situation during the recording of bioelectric events was analyzed. This analysis was used as a basis for the design of instrumentation. The analysis starts with the transducers in bioelectric recordings: the electrodes. Part 1 is completed with a chapter on the main specifications of the systems to be developed. In Part 2, several hardware implementations based on the developed theory are described. They include the following: (1) the design of amplifiers for bioelectric events; (2) the transmission of the biomedical signals from the isolated front-end to the signal processing hardware; (3) the use of optical fibers, and (4) wireless telemetry systems.

NTIS

N95-13423*# Benson (Robert H.), Springfield, VA.

LIFE SCIENCES CENTRIFUGE FACILITY ASSESSMENT Final Report, 15 Aug. - 15 Sep. 1994

ROBERT H. BENSON 15 Sep. 1994 8 p

(Contract(s)/Grant(s): NASA ORDER H-22787-D)

(NASA-CR-196848; NAS 1.26:196848; MSFC-1) Avail: CASI HC A02/MF A01

This report provides an assessment of the status of the Centrifuge Facility being developed by ARC for flight on the International Space Station Alpha. The assessment includes technical status, schedules, budgets, project management, performance of facility relative to science requirements, and identifies risks and issues that need to be considered in future development activities.

Author

AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.

N95-11702# Civil Aeromedical Inst., Oklahoma City, OK.
**ELIMINATION OF QUININE IN TWO SUBJECTS AFTER
INGESTION OF TONIC WATER: AN EXPLORATORY STUDY**
Final Report
VICKY L. WHITE, DENNIS V. CANFIELD, and JERRY R.
HORDINSKY Aug. 1994 9 p
(DOT/FAA/AM-94/16) Avail: CASI HC A02/MF A01

Biological specimens from eight fatal aviation accidents out of 775 fatal aviation accidents analyzed in 1991 and 1992 were found to contain quinine. In one case, the investigators sought to identify the source of quinine found in the pilot. It was suggested that the quinine might have come from the consumption of tonic water. Since no recent use of quinine or tonic water could be found, the investigators asked how long quinine could be detected in a urine specimen. A limited research project was undertaken to provide a preliminary range of the approximate length of time quinine could be detected in urine and blood. Each of two male subjects was given a 20 oz. bottle of tonic water, which contained 35 mg of quinine. Quinine was detected using standard laboratory thin layer chromatography (TLC) and high performance liquid chromatography (HPLC) methods. Quinine has such diverse applications as a treatment for muscle cramps and malaria, in addition to being an additive in tonic water. Since adverse effects have been identified at plasma concentrations between 10-15 micro-g/mL, no performance effects would be expected from the maximum concentrations of quinine found (0.291 micro-g/mL) in this study after the ingestion of one 20 oz. bottle of tonic water. However, based on this study, the possibility of prolonged detection (over eight days) of quinine should (1) serve as a warning against using this as a sign of recent use of quinine directly or in association with alcohol, and (2) alert the investigators to inquire about disorders or conditions that might impair performance, but for which quinine treatment was terminated days before the accident. Author

N95-11708*# Texas Univ., Austin, TX. Dept. of Biomedical Engineering.
**PRECONDITIONING ELECTROMYOGRAPHIC DATA FOR AN
UPPER EXTREMITY MODEL USING NEURAL NETWORKS**
D. J. ROBERSON, M. FERNJALLAH, R. E. BARR, and R. V.
GONZALEZ 1994 3 p
(Contract(s)/Grant(s): NAS9-18773)
(NASA-CR-196877; NAS 1.26:196877) Avail: CASI HC A01/MF
A01

A back propagation neural network has been employed to precondition the electromyographic signal (EMG) that drives a computational model of the human upper extremity. This model is used to determine the complex relationship between EMG and muscle activation, and generates an optimal muscle activation scheme that simulates the actual activation. While the experimental and model predicted results of the ballistic muscle movement are very similar, the activation function between the start and the finish is not. This neural network preconditions the signal in an attempt to more closely model the actual activation function over the entire course of the muscle movement. Author

N95-11744# Joint Publications Research Service, Arlington, VA.
**JPRS REPORT: SCIENCE AND TECHNOLOGY. CENTRAL
EURASIA: LIFE SCIENCES**
20 Oct. 1993 64 p Transl. into ENGLISH from various Russian
articles
(JPRS-ULS-93-012) Avail: CASI HC A04/MF A01

Translations are presented covering the following areas of the life sciences: biochemistry, biophysics, biotechnology, environ-

ment, epidemiology, immunology, medicine, microbiology, nonionizing radiation effects, pharmacology, toxicology, physiology, public health, and radiation biology. CASI

N95-11806# Polish Academy of Sciences, Warsaw (Poland). Inst. Podstawowych Problemow Techniki.
**A NUMERICAL ANALYSIS OF THE DISTRIBUTION OF
STRESSES IN LUNG PARENCHYMA WHICH ACCOUNTS FOR
THE INTERACTIONS BETWEEN THE TISSUE SKELETON AND
FLOWING AIR** Ph.D. Thesis [NUMERYCZNA ANALIZA
ROZKLADU NAPREZEN W MIAZZSU PLUCNYM Z
UWZGLEDNieniem ODDZIAlyWAN MIEDZY SZKIELETEM
TKANKOWYM A PRZEPLYWAJACYM POWIETRZEM]
PIOTR KOWALCZYK 1993 93 p In POLISH
(ISSN 0208-5658) Avail: CASI HC A05/MF A01

This article presents a numerical model which enables the approximate determination of the distribution of strains and stresses in lung tissue during respiration. It includes the formulation of a basic system of differential equations for the problem, time and space sampling of the system and the development of an algorithm for solving the system, and implementation of the system in a computer program. The computer model accounts for the non-linear mechanical properties of the tissue, their extensive deformation, and the effect of variations in the distribution of gas pressure and flow in the air spaces of the lungs. Part 1 explains the basic approach to the subject and briefly discusses extant research on the mechanics of the respiration process. Part 2 presents a physical model of the problem. It also contains a brief discussion of the anatomy and physiology of the lungs. Then follows a discussion of extant knowledge of the mechanical properties of lung tissue and a critical overview of previously used constitutional models of lung tissue. The following subsection contains an analysis of air flow in respiratory tracts and presents a model of the mechanical relationships between this flow and the deformation of the tissue skeleton. It consists of a system of discretely modelled air ducts embedded in a two-phase porous medium which fills the spaces of the lungs. Next the author writes a system of differential equations for the problem which includes an equation for flow in the respiratory tree, an equation for equilibrium in the lung tissue, and an equation for gas filtration in the tissue, along with their respective boundary and initial conditions. The author introduces the concept of a contact layer along with an additional equilibrium equation for the purpose of simplifying the numerical realization of a mixed boundary condition for displacements and stresses. In Part 3 the author presents a numerical algorithm which provides an approximate solution of the equations of the problem by means of an increment version of the finite element method. The author gives a matrix formulation of a conjugate problem in which the unknown variables at each step are the increments of flows in the components of the respiratory tree and the increments of displacements and pressures at the nodes of the finite element grid. The author describes an iterative procedure for solving the problem with an implicit numerical time integration scheme. Examples of numerical computations performed by means of the aforementioned algorithm implemented in a computer program are discussed in Part 4. Among other subjects, the author studied the static characteristics of a model of the human lungs under the action of the tissue's own weight and the effect of the inhalation rate on local ventilation and stresses in different regions of the lungs. Part 5 contains a critical analysis of the model and its results and recommendations for further research in the field. It also summarizes the original work embodied in the thesis.

Author (revised)

N95-11808*# New England Deaconess Hospital, Boston, MA. Lab. of Cancer Biology.
**MORPHOLOGICAL DIFFERENTIATION OF COLON
CARCINOMA CELL LINES IN ROTATING WALL VESSELS**
Final Report, 1 Jun. 1991 - 31 May 1994
J. M. JESSUP 1994 76 p
(Contract(s)/Grant(s): NAG9-520)

(NASA-CR-196780; REPT-115-38-8515; NAS 1.26:196780) Avail: CASI HC A05/MF A01

The objectives of this project were to determine whether (1) microgravity permits unique, three-dimensional cultures of neoplastic human colon tissues and (2) this culture interaction produces novel intestinal growth and differentiation factors. The initial phase of this project tested the efficacy of simulated microgravity for the cultivation and differentiation of human colon carcinoma in rotating wall vessels (RWV's) on microcarrier beads. The RWV's simulate microgravity by randomizing the gravity vector in an aqueous medium under a low shear stress environment in unit gravity. This simulation achieves approximately a one-fifth g environment that allows cells to 'float' and form three-dimensional relationships with less shear stress than in other stirred aqueous medium bioreactors. In the second phase of this project we assessed the ability of human colon carcinoma lines to adhere to various substrates because adhesion is the first event that must occur to create three-dimensional masses. Finally, we tested growth factor production in the last phase of this project. Author

N95-11887* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
EVALUATION OF COSTAR MASS HANDLING CHARACTERISTICS IN AN ENVIRONMENT. A SIMULATION OF THE HUBBLE SPACE TELESCOPE SERVICE MISSION
 SUDHAKAR L. RAJULU (Lockheed Engineering and Sciences Co., Houston, TX.), GLENN K. KLUTE, and LAUREN FLETCHER
 Aug. 1994 59 p
 (NASA-TP-3489; S-775; NAS 1.60:3489) Avail: CASI HC A04/MF A01

The STS-61 Shuttle mission, which took place in December 1993, was solely aimed at servicing the Hubble Space Telescope (HST). Successful completion of this mission was critical to NASA since it was necessary to rectify a flaw in the HST mirror. In addition, NASA had never scheduled a mission with such a high quantity of complex extravehicular activity. To meet the challenge of this mission, the STS-61 crew trained extensively in the Weightless Environment Test Facility at the Johnson Space Center and in the Neutral Buoyancy Simulator at the Marshall Space Flight Center. However, it was suspected that neutral buoyancy training might induce negative training by virtue of the viscous damping effect present in water. The mockups built for this training also did not have the mass properties of the actual orbital replacement units (ORUs). It was felt that the crew should be further trained on mockups with similar mass characteristics. A comprehensive study was designed to address these issues. The study was quantitative, and instrumentation was set up to measure and quantify the forces and moments experienced during ORU mass handling and remote manipulator system run conditions. Author

N95-12376* Mount Sinai School of Medicine, New York, NY. Dept. of Neurology.

REDUCTION OF OCULAR COUNTER-ROLLING BY ADAPTATION TO SPACE Final Report

MINGJIA DAI, LEIGH MCGARVIE, INESSA KOZLOVSKAYA, MISCHA SIROTA, THEODORE RAPHAN, and BERNARD COHEN
 15 Nov. 1993 23 p
 (Contract(s)/Grant(s): NAG2-573; NAG2-703)
 (NASA-CR-196279; NAS 1.26:196279) Avail: CASI HC A03/MF A01

We studied the three-dimensional vestibulo-ocular reflex (VOR) of rhesus monkeys before and after the COSMOS Biosatellite 2229 Mission of 1992-1993. This included tests of ocular counter-rolling (OCR), the gain of the vestibulo-ocular reflex (VOR), and spatial orientation of velocity storage. A four-axis vestibular and oculomotor stimulator was transported to the Institute of Biomedical Problems in Moscow for the pre- and postflight ground-based testing. Twelve normal juvenile male rhesus monkey were implanted surgically with eye coils and tested 60-90 days before spaceflight. Two monkey (7906 and 6151), selected from the twelve as flight animals, flew from 12/29/92 to 1/10/93. Upon recovery, they were tested for 11

days postflight along with three control animals. Compensatory ocular torsion was produced in two ways: (1) Lateral head tilts evoked OCR through otolith-ocular reflexes. OCR was also measured dynamically during off-vertical axis rotation (OVAR). (2) Rotation about a naso-occipital axis that was either vertical or horizontal elicited torsional nystagmus through semicircular canal-ocular reflexes (roll VOR). OCR from the otoliths was substantially reduced (70 percent) for 11 days after reentry on both modes of testing. The gain of the roll VOR was also decreased, but less than OCR. These data demonstrate that there was a long-lasting depression of torsional or roll eye movements after adaptation to microgravity in these monkeys, especially those movements produced by the otolith organs. Author (revised)

N95-12405# Army Aeromedical Research Lab., Fort Rucker, AL.
BIOMEDICAL IMAGING

JAMES E. BRUCKART Apr. 1994 30 p
 (AD-A282221) Avail: CASI HC A03/MF A01

This paper has been prepared for submission to the Advisory Group for Aerospace Research and Development (AGARD) Working Group 20 as a chapter on three-dimensional image collection for a report on 3D anthropometry. The principal 3D anthropometry data acquisition task, imaging the human body, presents technical barriers. The ultimate choice of an imaging technique depends on the specific details of an object that require reproduction and the precision required from the task. This report details the technologies in surface and subsurface imaging systems for research and commercial applications. DTIC

N95-12406# Army Aeromedical Research Lab., Fort Rucker, AL.
DYNAMIC SINE WAVE RESPONSE MEASUREMENTS OF CRT DISPLAYS USING SINUSOIDAL COUNTERPHASE MODULATION

ROBERT W. VERONA, HOWARD H. BEASLEY, JOHN S. MARTIN, and VICTOR KLYMENKO Apr. 1994 20 p
 (AD-A282222; USAARL-94-22) Avail: CASI HC A03/MF A01

The current practice of basing the performance of cathode ray tube (CRT) displays on static image quality figures-of-merit fails to provide a valid assessment of a display's ability to reproduce real-world scenes where there is relative motion within the scene or between the sensor and scene. Techniques which provide assessment of a display's capability to reproduce spatial information in a dynamic environment are needed. One technique based on response to sinusoidal counterphase modulation is presented. DTIC

N95-12535 Massachusetts General Hospital, Boston, MA.
ULTRASHORT LASER PULSE EFFECTS IN OCULAR AND RELATED MEDIA: LASER-INDUCED SHOCK WAVE PROPAGATION AND RETINAL DAMAGE Annual Technical Report, 15 Apr. 1993 - 14 Apr. 1994

T. F. DEUTSCH, A. G. DOUKAS, T. FLOTTE, K. DOREY, and S. LEE Jun. 1994 8 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality (Contract(s)/Grant(s): F49620-93-1-0290)
 (AD-A282599; AFOSR-94-0464TR) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

The goals of this project are: (1) to develop assays for functional damage to retinal cells by pressure waves (stress transients); (2) to determine the acoustic properties of the aqueous and vitreous humors of the eye; and (3) to examine the effect of pressure waves to the retinal pigment epithelium in vitro. During this first year our efforts have been directed primarily at the first goal, with some initial efforts on the second. During this period we developed the capability of growing human retinal pigment epithelium (RPE) cells in culture, incorporating them in test capillaries, recovering them after exposure to stress transients and assessing cell damage. DTIC

N95-12542 Shock Society, Augusta, GA.
SUMMARY OF THE SIXTEENTH ANNUAL CONFERENCE ON SHOCK Summary Report

10 Jul. 1994 9 p Conference held in Santa Fe, NM, 13-16 Jun. 1993 Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract(s)/Grant(s): N00014-93-1-0951)
(AD-A282643) Avail: CASI HC A02

Thirty-two abstracts were selected for presentation in four minisymposia which cover topics including adhesion molecules, mediators, endotoxin/sepsis, and hemorrhage/ischemia-reperfusion. In addition, 194 abstracts were scheduled as poster presentations in three sessions: 'Hemorrhage/Ischemia-Reperfusion', 'Mediators', and 'Endotoxin/Sepsis.' A workshop, 'Basic Molecular Biology Concepts and Techniques', was scheduled. Symposia dealing with 'Biological Roles of Nitric Oxide in Sepsis and Tissue Injury', 'Molecular Mechanisms in Shock', and 'New Insights into Mediator Interactions in Sepsis and ARDS', were complimented with a debate on 'Controversies in Shock Research.' CASI

N95-12593 Edgewood Arsenal, Aberdeen Proving Ground, MD. Research, Development and Engineering Center.

COMPARISON OF SUBMAXIMAL CYCLING AND TREADMILL EXERCISE AT SIMILAR WORK RATES Final Report, Nov. 1991 - Jun. 1992

DAVID M. CARETTI Jul. 1994 15 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(Contract(s)/Grant(s): DA PROJ. 101-62622-A-553)
(AD-A283430; ERDEC-TR-175) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

The increased use of both the treadmill and cycle ergometer for exercise testing during respirator wear has escalated the need to compare the physiological response relationships between modes. This study compared circulatory, respiratory, and metabolic responses of submaximal cycling and treadmill exercise of similar work rates in 8 males and 6 females to determine whether the two exercise modes elicited different responses. Gender differences for each exercise mode were also assessed. Subjects cycled or walked for 5 min at each of five incremental external work rates of 60, 90, 120, 150, and 180 W. Measurements of HR, $V(T)$, $F(b)$, $V(E)$, $V(O_2)$, and $V(CO_2)$ were obtained for each minute of exercise. Varying differences were observed in the respiratory and metabolic responses within gender groups to exercise between cycling and treadmill exercise of equal work rates with cycling eliciting greater responses at intensities of greater than 120 W. For cycling and treadmill exercise, females had significantly higher HR and $F(b)$ than males at intensities greater than 90 W, but metabolic responses were similar between gender groups. These results suggest that both exercise modes are useful for protocols evaluating the physiological effects of mask wear during low levels of physical exertion. However, treadmill exercise seems better suited for testing at higher submaximal work rates. DTIC

N95-12792* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

CREW FACTORS IN FLIGHT OPERATIONS 9: EFFECTS OF PLANNED COCKPIT REST ON CREW PERFORMANCE AND ALERTNESS IN LONG-HAUL OPERATIONS

MARK R. ROSEKIND, R. CURTIS GRAEBER, DAVID F. DINGES, LINDA J. CONNELL, MICHAEL S. ROUNTREE, CHERYL L. SPINWEBER, and KELLY A. GILLEN Sep. 1994 80 p

(Contract(s)/Grant(s): RTOP 505-64-53)
(NASA-TM-108839; A-94134; NAS 1.15:108839; DOT/FAA/92/24)
Avail: CASI HC A05/MF A01

This study examined the effectiveness of a planned cockpit rest period to improve alertness and performance in long-haul flight operations. The Rest Group (12 crew members) was allowed a planned 40 minute rest period during the low workload, cruise portion of the flight, while the No-Rest Group (9 crew members) had a 40 minute planned control period when they maintained usual flight activities. Measures used in the study included continuous ambulatory recordings of brain wave and eye movement activity, a reaction time/vigilance task, a wrist activity monitor, in-flight fatigue and

alertness ratings, a daily log for noting sleep periods, meals, exercise, flight and duty periods, and the NASA Background Questionnaire. The Rest Group pilots slept on 93 percent of the opportunities, falling asleep in 5.6 minutes and sleeping for 25.8 minutes. This nap was associated with improved physiological alertness and performance compared to the No-Rest Group. The benefits of the nap were observed through the critical descent and landing phases of flight. The nap did not affect layover sleep or the cumulative sleep debt. The nap procedures were implemented with minimal disruption to usual flight operations and there were no reported or identified concerns regarding safety. Author

N95-12919 Rome Lab., Griffiss AFB, NY.

RADIOFREQUENCY/MICROWAVE RADIATION BIOLOGICAL EFFECTS AND SAFETY STANDARDS: A REVIEW Report, Jun. 1988 - May 1993

SCOTT M. BOLEN Jun. 1994 31 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(Contract(s)/Grant(s): AF PROJ. 4506)
(AD-A282886; RL-TR-94-53) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

The study of human exposure to radiofrequency/microwave (RF/MW) radiation has been the subject of widespread investigation and analysis. It is known that electromagnetic radiation has a biological effect on human tissue. An attempt has been made by researchers to quantify the effects of radiation exposure on the human body and to set guidelines for safe exposure levels. A review of the pertinent findings is presented along with the American National Standards Institute (ANSI) recommended safety standard and the United States Air Force permissible exposure limit for RF/MW radiation. An overview of research conducted in the Soviet Union and Eastern Europe is also included in this report. DTIC

N95-13054 Army Aeromedical Research Lab., Fort Rucker, AL.
AVIATION EPIDEMIOLOGY DATA REGISTER: CARDIOVASCULAR DISEASE SCREENING OUTCOMES IN THE NORTH DAKOTA ARMY NATIONAL GUARD AVIATOR COHORT Final Report

KEVIN T. MASON and S. G. SHANNON Jun. 1994 30 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(Contract(s)/Grant(s): DA PROJ. 301-62787-A-878)
(AD-A283064; USAARL-94-31) Avail: CASI HC A03

This study compared the aeromedical cardiovascular disease screening outcomes between the North Dakota Army National Guard (NDARNG) aviator cohort and a peer cohort composed of all other Army National Guard (ARNG) aviators. Each cohort included aviators age 40 or older which is the age aviators enter the cardiovascular disease screening program for the detection of disease. The study was based on analysis of factors found in the U.S. Army Aviation Epidemiology Data Register. Analyses were conducted using nonparametric, relative risk, odds ratio, and matched pair case control methods. DTIC

N95-13177 European Office of Aerospace Research and Development, FPO New York, NY.

EFFECTS OF NOISE ON HEARING 5TH INTERNATIONAL SYMPOSIUM

14 May 1994 59 p Symposium held in Gothenburg, Sweden, 12-14 May 1994 Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(AD-A281439) Avail: CASI HC A04

Abstracts for oral presentations include the following: The Effects of Acoustic Trauma, Other Cochlear Injury and Death on Basilar-membrane Responses to Sound; Noise Induced Expression of Heat Shock Proteins in the Cochlea; Genetic Susceptibility to Noise-Induced Hearing Loss in Mice; Sensory Cell Regeneration and Functional Recovery Following Acoustic Trauma and Aminoglycoside Ototoxicity; The Effects of Noise on Cochlear Blood Flow; Efferent and Priming Modulation of Noise-Induced Hearing Loss; Threshold Shift Dynamics Following Interrupted Impact or Continuous Noise Exposure; Interac-

tions Between Age-related and Noise-induced Hearing Loss; Effects of Intense Noise on Fetal Sheep Auditory Brainstem Response; Underwater Hearing and Occupational Noise Exposure; International Review of Field Studies of Hearing Protector Attenuation; Current Standards for Occupational Exposure to Noise; and more. Abstracts for posters are also included. CASI

N95-13230* National Aeronautics and Space Administration, Washington, DC.

AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 394)

Dec. 1992 41 p

(NASA-SP-7011(394); NAS 1.21:7011(394)) Avail: CASI HC A03

This bibliography lists 71 reports, articles and other documents introduced into the NASA Scientific and Technical Information System during Nov. 1994. Subject coverage includes: aerospace medicine and physiology, life support systems and man/system technology, protective clothing, exobiology and extraterrestrial life, planetary biology, and flight crew behavior and performance.

Author

N95-13270* Texas Univ., Austin, TX. Dept. of Mechanical Engineering.

A MUSCULOSKELETAL MODEL OF THE ELBOW JOINT COMPLEX

ROGER V. GONZALEZ, RONALD E. BARR, and LAWRENCE D. ABRAHAM 1993 2 p

(Contract(s)/Grant(s): NAG9-588)

(NASA-CR-195812; NAS 1.26:195812) Avail: CASI HC A01/MF A01

This paper describes a musculoskeletal model that represents human elbow flexion-extension and forearm pronation-supination. Musculotendon parameters and the skeletal geometry were determined for the musculoskeletal model in the analysis of ballistic elbow joint complex movements. The key objective was to develop a computational model, guided by optimal control, to investigate the relationship among patterns of muscle excitation, individual muscle forces, and movement kinematics. The model was verified using experimental kinematic, torque, and electromyographic data from volunteer subjects performing both isometric and ballistic elbow joint complex movements. In general, the model predicted kinematic and muscle excitation patterns similar to what was experimentally measured.

Author

53

BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N95-11872 National Defence Research Establishment, Stockholm (Sweden). Huvudavdelning foer Maensklig Prestation och Funktion. **TANK CREW PERFORMANCE RELATED TO COGNITIVE ABILITY AND MOTIVATION OF THE TANK CREW MEMBERS [PRESTATION HOS STRIDSVAGNSBESAETTNINGAR RELATERAD TILL KOGNITIV FOERMAGA OCH MOTIVATION HOS BESAETTNINGSMEDLEMMARNA]**

C. WALLENUS Dec. 1993 33 p In SWEDISH

(PB94-190642; FOA-C-50103-5.3) Avail: Issuing Activity (National Technical Information Service (NTIS))

Tank crews from three Swedish armored regiments were divided into three criterion groups with regard to performance: below average, average, and above average. Cognitive ability, ability to structure, emotional commitment, experience of control and appraisal of person-related and task-related group cohesion respectively, were studied at the individual level in the three criterion groups (n=130). The results showed that individuals who belonged to tank crew whose performance was below average had a lower emotional

commitment and perceived less task-related group cohesion. On the other hand, these individuals showed on average a better ability to structure and, to some extent, greater experience of control, compared with individuals in groups that were assessed as average in performance. There were no differences between the three criterion groups with reference to cognitive ability or person-related group cohesion. Implications of the results for selection and training are discussed. NTIS

N95-11942 Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.

HOW ARE THREE-DIMENSIONAL OBJECTS REPRESENTED IN THE BRAIN?

HEINRICH H. BUELTHOFF, SHIMON Y. EDELMAN, and MICHAEL J. TARR 18 Apr. 1994 20 p Limited Reproducibility: More

than 20% of this document may be affected by microfiche quality (Contract(s)/Grant(s): N00014-92-J-1879; N00014-93-1-0385)

(AD-A282367; AI-M-1479) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

We discuss a variety of psychophysical experiments that explore different aspects of the problem of object recognition and representation in human vision. In all experiments, subjects were presented with realistically rendered images of computer-generated three-dimensional objects, with tight control over stimulus shape, surface properties, illumination, and viewpoint, as well as subjects' prior exposure to the stimulus objects. Contrary to the predictions of the paradigmatic theory of recognition, which holds that object representations are viewpoint invariant, performance in all experiments was consistently viewpoint dependent, was only partially aided by binocular stereo and other depth information, was specific to viewpoints that were familiar, and was systematically disrupted by rotation in depth more than by deforming the two-dimensional images of the stimuli. The emerging concept of multiple-views representation supported by these results is consistent with recently advanced computational theories of recognition based on view interpolation. Moreover, in several simulated experiments employing the same stimuli used in experiments with human subjects, models based on multiple-views representations replicated many of the psychophysical results concerning the observed pattern of human performance. DTIC

N95-12133# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France). Aerospace Medical Panel.

PSYCHOPHYSIOLOGICAL ASSESSMENT METHODS (INCLUDING A REGISTER OF PSYCHOPHYSIOLOGISTS ON MICROFICHES) [METHODES D'EVALUATION PSYCHOPHYSIOLOGIQUE (LISTE DE PSYCHOPHYSIOLOGUES INCLUSE SUR MICROFICHES)]

JOHN A. CALDWELL (Army Aeromedical Research Lab., Fort Rucker, AL.), GLENN F. WILSON, MUZAFFER CETINGUC, ANTHONY W. K. GAILLARD, ALEXANDER GUNDER, DIDIER LAGARDE, SCOTT MAKEIG, GRETE MYHRE, and NICOLA A. WRIGHT May 1994 157 p Original contains color illustrations (AGARD-AR-324; ISBN-92-835-0747-9) Copyright Avail: CASI HC A08/MF A02

The study of human-centered operationally-relevant problems in aerospace and aviation research and development can be enhanced by the inclusion of psychophysiological techniques. By measuring physiological variables in conjunction with performance and subjective measures, a more thorough understanding about the processes underlying performance can be obtained. This report presents a summary of the general utility of psychophysiological assessments, the types of applied problems which can be addressed with these assessments, and the qualities of several psychophysiological techniques. In addition, safety and ethical considerations, guidelines for making determinations about the most appropriate research strategy, and three research examples are discussed. The report concludes with a series of appendixes which offer the reader information on how to collect and analyze each of the psychophysiological measures. This Advisory Report

was sponsored by the Aerospace Medical Panel of the Advisory Group for Aerospace Research and Development (AGARD).

Author

N95-12495# Johns Hopkins Univ., Baltimore, MD. School of Medicine.

VISUAL PSYCHOPHYSICS OF EGOMOTION Final Report

KATHLEEN TURANO 30 Jun. 1994 10 p

(Contract(s)/Grant(s): AF-AFOSR-0154-91)

(AD-A282547; AFOSR-94-0450TR) Avail: CASI HC A02/MF A01

Human observers' ability to perceive self motion using information contained within optic-flow patterns was investigated. Subjects discriminated changes in heading direction as stimulus parameters were manipulated. Some of the results were surprising and difficult to explain in the context of current theories. In order to better understand the results, the role of eye movements in self-motion detection and in speed discrimination was investigated. The end product is a model that can account for the findings. The optimal stimulus for motion detection was also explored to define the shape (x,y,t) of the human motion sensors, which are believed to be involved in the early processing stages of self-motion perception. A computational model for the extraction of 3D motion information from 2D motion information was also developed. The neural network model was able to qualitatively account for the human observer's ability to detect changes in heading direction. DTIC

N95-13019# Civil Aeromedical Inst., Oklahoma City, OK.

AGE 60 RULE RESEARCH. PART 1: BIBLIOGRAPHIC DATABASE Final Report

Washington Oct. 1994 181 p Prepared in cooperation with Hilton Systems, Inc., Cherry Hill, NJ

(Contract(s)/Grant(s): DTFA02-90-C-90125; FAA TASK AM-A-94-HRR-138)

(DOT/FAA/AM-94/20-PT-1) Avail: CASI HC A09/MF A02

As part of their research contract with the FAA to study issues related to the 'Age 60 Rule' for pilot mandatory retirement, Hilton Systems, Inc. in collaboration with Lehigh University faculty and research facilities compiled this extensive bibliography. Topics included pilot aging, performance, health and physiological factors, as well as other aviation and pilot related topics. Citations were included from a variety of sources including international and military studies. The bibliography was organized in three sections. The first section presents a bibliographic listing on the above topics. The second section provides a listing of publications by authors active in related fields. Finally, the third section provides citations from the driving literature. Author

N95-13020# Civil Aeromedical Inst., Oklahoma City, OK.

AGE 60 RULE. PART 2: AIRLINE PILOT AGE AND PERFORMANCE. A REVIEW OF THE SCIENTIFIC LITERATURE Final Report

D. T. HYLAND (Lehigh Univ., Bethlehem, PA.), E. J. KAY (Lehigh Univ., Bethlehem, PA.), J. D. DEIMLER (Hilton Systems, Inc., Cherry Hill, NJ.), and E. B. GURMAN (University of Southern Mississippi, Hattiesburg, MS.) Washington Oct. 1994 138 p

(Contract(s)/Grant(s): DTFA02-90-C-90125; FAA TASK AM-A-91-HRR-138)

(DOT/FAA/AM-94/21-PT-2; REPT-8025-1A-PT-2) Avail: CASI HC A07/MF A02

This review of the literature establishes the scientific foundation for subsequent studies on the 'Age 60 Rule' research conducted under a contract with Hilton Systems, Inc. The scientific literature relevant to the two separate scientific approaches required by the contract is reviewed. The document first provides a review of the Age 60 Rule, as well as the theoretical and methodological considerations critical to the study of aging and the assessment of individual pilot performance. A proposed model is presented to form a framework for the research. Pilot behaviors affected by aging and/or experience are reviewed. Specific performance assessment batteries are reviewed in detail in Appendix A. Issues related to measuring complex pilot performance are discussed. Recommendations and

criteria for developing a performance methodology are presented. The second part of the literature review provides a discussion of the issues related to the analyses of existing data to assess the relationship between pilot age, experience, and accident rates. This section provides a critical review of existing analyses and presents recommendations for an improved analytical methodology. Author

N95-13199# Hilton Systems, Inc., Cherry Hill, NJ.

AGE 60 STUDY. PART 4: EXPERIMENTAL EVALUATION OF PILOT PERFORMANCE Final Report

D. T. HYLAND (Lehigh Univ., Bethlehem, PA.), E. J. KAY (Lehigh Univ., Bethlehem, PA.), and J. D. DEIMLER Oct. 1994 66 p

(Contract(s)/Grant(s): DTFA02-90-C-90125)

(REPT-8025-4B; DOT/FAA/AM-94/23) Avail: CASI HC A04/MF A01

The purpose of this study was to examine the feasibility of developing an individually-based pilot performance assessment, as well as design an experimental methodology to empirically examine the relationship between pilot aging and performance. Pilot performance was measured with both domain-dependent, as well as domain independent assessments to test a decrement with compensation model of expertise and aging. Computerized cognitive test batteries, COGSCREEN and WOMBAT, were selected as domain-independent measures. Flitescript and whole task performance in the B727 simulator were domain-dependent measures. Forty B727-rated pilots were recruited from air carriers and the FAA. Pilots were males between the ages of 41 and 71 years (M=53.9, sd=8.1). All pilots had a minimum of 5000 hours of total flight time with a wide range of total and recent hours in type. Three simulator scenarios were designed to assess pilot performance on routine and emergency/abnormal maneuvers. Simulator performance measures were based on a deviation score and an evaluator rating. The relationships between the following measures were assessed by examination of the correlations between: (1) flying experience and simulator performance, (2) predictor test scores and simulator performance, (3) interrelationship between the predictor tests, and (4) age, flying experience, predictor test scores and simulator performance. Finally, pilot perceptions of each measure were assessed. COGSCREEN total composite scores were significantly correlated with evaluator ratings on emergency/abnormal maneuvers. Neither WOMBAT nor Flitescript were found to correlate with simulator performance. Pilot age was significantly correlated with performance on the predictor tests. A pattern of inter-correlations among pilot age, COGSCREEN and simulator performance is discussed. Author (revised)

N95-13375# Maryland Univ., College Park, MD. Office of Research Administration and Advancement.

COORDINATED ACTION IN 3-D SPACE Final Report, 15 Dec. 1990 - 31 Mar. 1994

ROBERT M. STEINMAN 31 May 1994 6 p

(Contract(s)/Grant(s): AF-AFOSR-0124-91)

(AD-A281284; AFOSR-94-0401TR) Avail: CASI HC A02/MF A01

Unique hardware and novel software were developed to study natural patterns of head and eye movements during inspection and manipulation of objects in nearby 3-D space. Emphasis was placed on natural tasks in which subjects looked at and handled real objects in a natural visual environment with the head and torso free to move naturally. Two quite different mechanistic models of gaze control were tested: (a) an 'on-line' feedback model and (b) a 'single packet' model that bases accurate gaze control on preplanned patterns of coordinated movements of the head and eyes. We found that the VOR was not turned-off during gaze-shifts, as currently believed, but that it was not effective in compensating for abrupt displacements of the head as had been believed previously. The speed and accuracy of button presses produced by tapping and the correlation of these performance measures with binocular gaze-errors were also studied. These studies were performed to determine how accurate binocular fixation must be in order to insure rapid and accurate tapping in nearby 3-D space. We found that effective performance

was possible with binocular gaze-errors about the size of the human fovea (2 deg - 3 deg). DTIC

N95-13433 Newcastle-upon-Tyne Univ., Newcastle (England). Dept. of Computing Science.

SCENE ANALYSIS: A BRIEF SURVEY

C. ROBERTSON and G. M. MEGSON Mar. 1994 33 p See also AD-A162662 (PB94-205085; TRS-480) Copyright Avail: Issuing Activity (National Technical Information Service (NTIS))

A brief survey of scene analysis is presented. In particular we consider the complex and highly parallel process of image gathering in the eye and contrast this with current computer-based image analysis. A number of classical scene analysis techniques based on statistical methods are also outlined. NTIS

54

MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N95-11778# Technische Univ., Delft (Netherlands). Faculteit der Werktuigbouwkunde en Maritime Techniek.

DESIGN ISSUES OF HUMAN OPERATOR SUPPORT SYSTEMS Ph.D. Thesis

A. M. SASSEN 24 Aug. 1993 235 p (PB94-191376; ISBN-90-370-0090-8) Copyright Avail: CASI HC A11/MF A03

The thesis begins with an overview of the tasks of a human operator in a supervisory control system. This analysis results in an overview of possible human operator support systems. In Chapter 3, a number of problems have been identified which may account for a lack of acceptance of knowledge based support systems. Chapter 4 consists of a description of technology that is available to construct human operator support systems. It describes three different approaches to build diagnostic systems: the rule-based approach, systems that reason from first principles, and the multilevel flow modeling approach. All three are illustrated with examples taken from the domain of a nuclear power plant simulation. Chapter 5 contains an overview of the programming environment for expert systems constrained in reasoning time (PERFECT). PERFECT is aimed at providing the necessary engineering support in real-time knowledge based system development. Chapter 6 contains a description and the results of an evaluation of the diagnostic system of the generic nuclear plant as developed with PERFECT. The last chapter contains a summary of the conclusions of earlier chapters. Moreover, recommendations are made for further research.

NTIS

N95-11811*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

CARBON DIOXIDE AND WATER VAPOR PRODUCTION AT REST AND DURING EXERCISE. A REPORT ON DATA COLLECTION FOR THE CREW AND THERMAL SYSTEMS DIVISION

STUART M. C. LEE (Krug Life Sciences, Inc., Houston, TX.) and STEVEN F. SICONOLFI Aug. 1994 13 p (NASA-TP-3500; S-781; NAS 1.60:3500) Avail: CASI HC A03/MF A01

The current environmental control device in the shuttle uses lithium hydroxide (LiOH) filter canisters to remove carbon dioxide (CO₂) from the cabin air, requiring several bulky filter canisters that can only be used once and must be changed frequently. To alleviate a stowage problem and decrease launch weight, the Crew and Thermal Systems Division (CTSD) at the NASA Johnson Space Center has been researching a system to be used on future shuttle missions. This system uses two beds of solid amine material to absorb CO₂ and water, later desorbing them to space vacuum. In

this way the air scrubbing medium is regenerable and reusable. To identify the efficacy of this regenerable CO₂ removal system (RCRS), CTSD began investigations in the shuttle mockup. The purpose of this investigation was to support the CTSD program by determining mean levels of carbon dioxide and water vapor production in normal, healthy males and females age-matched with the astronaut corps. Subjects' responses were measured at rest and during exercise at intensity levels equivalent to normal shuttle operation activities. The results were used to assess the adjustments made to RCRS and are reported as a reference for future investigations in shuttle environmental control. Author

N95-11873 National Defence Research Establishment, Stockholm (Sweden). Huvudavdelning foer Maensklig Prestation och Funktion. **VISIT TO UDRI AND USAF, ARMSTRONG LAB., WILLIAMS AFB, PHOENIX, USA, FEBRUARY 8-11, 1993 [BESOEK VID UDRI OCH USAF-ARMSTRONG LAB., WILLIAMS AFB, PHOENIX, USA. FLYGTEKNISK OCH HUMANVETENSKAPLIG FORSKNING I DISTRIBUTUEADE FLYGTRAENINGSSIMULATORER, 1993-02-08-11]**

G. DEREFELDT and U. ENGDahl Nov. 1993 58 p In SWEDISH

(PB94-190659; FOA-A-50020-5.2) Avail: Issuing Activity (National Technical Information Service (NTIS))

The document reports on a visit on 11-18 Feb. 1993 to the University of Dayton Research Institute (UDRI) and to AL/HRA (Aircrew Training Research Division, Human Resources Directorate, USAF-Armstrong Laboratory, Williams Air Force Base) in Arizona, USA. The main purpose of the journey was to strengthen the contacts in the field of color presentations, visual displays in flight simulation, situational awareness and night vision devices (NVD). AL/HRA is the Air Force's premier organization for research and development in aircrew training techniques and technologies. Its basic mission is to increase aircrew effectiveness and to provide enhanced training systems for combat preparation. For better aircrew training at lower cost, new aircrew training system technology is advanced and the training effectiveness of that technology is evaluated. At Armstrong Lab, work is concentrated in three primary areas: (1) Basic research (concentrated in visual attention and cognitive processing); (2) Training effectiveness (to make optimal use of existing and future training resources); and (3) Technology development (including exploratory and advanced work on aircrew training devices). Personnel from UDRI are involved in both the basic research and the training effectiveness areas, which includes visual requirements and the adaptation of these requirements to visual simulation. NTIS

N95-11878*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

HUMAN FACTORS ASSESSMENTS OF THE STS-57 SPACEHAB-1 MISSION

FRANCES E. MOUNT, SUE ADAM, TIM MCKAY, MIHRIBAN WHITMORE, DARLENE MERCED-MOORE, TINA HOLDEN, CHARLES WHEELWRIGHT, ANTON KOROS, SR., MICHAEL ONEAL, JENNIFER TOOLE et al. Aug. 1994 42 p (Contract(s)/Grant(s): NAS9-17900; NAS9-18800) (NASA-TM-104802; S-779; NAS 1.15:104802) Avail: CASI HC A03/MF A01

SpaceHab-1 (STS-57) was the first of six scheduled Commercial Middeck Augmentation Module (CMAM) missions seeking to offer entrepreneurial companies an opportunity to use the resource of microgravity. The SpaceHab module, which occupies about one-fourth of the payload bay, is approximately 2-3/4 meters (9 feet) long and 4 meters (13.5 feet) in diameter. It provides a shirt-sleeve working environment and contains the storage space equivalent of 50 middeck lockers, considerably over and above the number of experiments that can be carried in the orbiter middeck alone. A modified Spacelab tunnel links the SpaceHab module to the middeck. While in orbit, the orbiter payload bay doors remain open, exposing the padded exterior of the lab and tunnel to space until preparation for reentry at the end of the flight. The crew for SpaceHab-1 was

comprised of four males and two females, each of whom participated in some part of the human factors assessment (HFA) evaluation. The HFA was one of over twenty experiments manifested on this maiden flight of the SpaceHab module. HFA consisted of HFA-EPROC, HFA-LIGHT, HFA-SOUND, HFA-QUEST, and HFA-TRANS. The goal of HFA-EPROC was to assess the advantages and disadvantages of paper versus computer presentation for procedural tasks. The next two evaluations investigated the module's lighting and acoustic environment. HFA-TRANS sought to evaluate the design of the SpaceHab tunnel and to characterize translation through it. HFA-QUEST represented a consolidation of the in-flight questions generated by the HFA principal investigators involved in the acoustic, lighting, and translation studies. Author (revised)

N95-11905*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

INTERVIEWS WITH THE APOLLO LUNAR SURFACE ASTRONAUTS IN SUPPORT OF PLANNING FOR EVA SYSTEMS DESIGN

MARY M. CONNORS, DEAN B. EPPLER, and DANIEL G. MORROW Sep. 1994 21 p

(Contract(s)/Grant(s): RTOP 199-06-12)

(NASA-TM-108846; A-94131; NAS 1.15:108846) Avail: CASI HC A03/MF A01

Focused interviews were conducted with the Apollo astronauts who landed on the moon. The purpose of these interviews was to help define extravehicular activity (EVA) system requirements for future lunar and planetary missions. Information from the interviews was examined with particular attention to identifying areas of consensus, since some commonality of experience is necessary to aid in the design of advanced systems. Results are presented under the following categories: mission approach; mission structure; suits; portable life support systems; dust control; gloves; automation; information, displays, and controls; rovers and remotes; tools; operations; training; and general comments. Research recommendations are offered, along with supporting information. Author

N95-11908# National Inst. of Standards and Technology, Gaithersburg, MD. Factory Automation Systems Div.

BODY DIMENSIONS FOR APPAREL

Y. T. T. LEE Apr. 1994 30 p See also PB93-158665 Sponsored by Defense Logistics Agency

(PB94-187739; NISTIR-5411) Avail: CASI HC A03/MF A01

This report represents a compilation of body dimensions that are used in the manufacturing and fitting of apparel. It is the result of a comparison of five body measurements reports, including documentations of national and international apparel sizing standards. The information in this report will provide the basis for the development of the information model of made-to-measure pattern making. It will also contribute to the conducting of future body measurements survey and the development of new or improved sizing standards for apparel. NTIS

N95-11949*# Wisconsin Univ., Madison, WI. Dept. of Horticulture.

GROWTH OF POTATOES FOR CELSS

T. W. TIBBITTS, W. CAO, and R. M. WHEELER Cleveland, OH NASA Aug. 1994 200 p

(Contract(s)/Grant(s): NCC2-301)

(NASA-CR-177646; A-94129; NAS 1.26:177646) Avail: CASI HC A09/MF A03

This report summarizes research on the utilization of white potatoes (*Solanum tuberosum* L.) for space life support systems at the University of Wisconsin-Madison over the period of 1984 to 1993. At full maturity the tuber productivity was 37.5 gm(exp -2) d(exp -1), equating to a growing area requirement for one human (2800 kcal d(exp -1)) of 10.1 m(exp -2). A recirculating nutrient system using slanted trays produced best potato growth and tuber yields when a 2-3 cm layer of gravel or arcillite media was utilized. Potato production was close to maximum under lighting levels of 400 micromol m(exp -2) s(exp -1) of photosynthetic photo flux (PPF) for

24 hours or 800 micromol m(exp -2) s(exp -1) for 12 hours, alternating diurnal temperatures of 22 C and 14 C, relative humidity of 85 percent, and a carbon dioxide level of 1000 micromol m(exp -1). The range of effective concentrations of each separate nutrient is reported. The extensive studies with potatoes in this project have demonstrated that this crop has high productivity of nutritious tubers with a high harvest index in controlled environments, and can fulfill a significant portion of the energy and protein requirements for humans in space. Author

N95-11962*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

TECHNIQUES FOR OPTIMAL CROP SELECTION IN A CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEM

ANN MCCORMACK, CORY FINN, and BETSY DUNSKY In its Technical Paper Contest for Women 1992. Space Challenges: Earth and Beyond p 81-96 1993 See also N93-12018

Avail: CASI HC A03/MF A03

A Controlled Ecological Life Support System (CELSS) utilizes a plant's natural ability to regenerate air and water while being grown as a food source in a closed life support system. Current plant research is directed toward obtaining quantitative empirical data on the regenerative ability of each species of plant and the system volume and power requirements. Two techniques were adapted to optimize crop species selection while at the same time minimizing the system volume and power requirements. Each allows the level of life support supplied by the plants to be selected, as well as other system parameters. The first technique uses decision analysis in the form of a spreadsheet. The second method, which is used as a comparison with and validation of the first, utilizes standard design optimization techniques. Simple models of plant processes are used in the development of these methods. Author

N95-11964*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

TRAINING FOR LIFE SCIENCE EXPERIMENTS IN SPACE AT THE NASA AMES RESEARCH CENTER

ANNETTE T. RODRIGUES and A. CHRISTOPHER MAESE In its Technical Paper Contest for Women 1992. Space Challenges: Earth and Beyond p 111-128 1993

Avail: CASI HC A03/MF A03

As this country prepares for exploration to other planets, the need to understand the affects of long duration exposure to microgravity is evident. The National Aeronautics and Space Administration (NASA) Ames Research Center's Space Life Sciences Payloads Office is responsible for a number of non-human life sciences payloads on NASA's Space Shuttle's Spacelab. Included in this responsibility is the training of those individuals who will be conducting the experiments during flight, the astronauts. Preparing a crew to conduct such experiments requires training protocols that build on simple tasks. Once a defined degree of performance proficiency is met for each task, these tasks are combined to increase the complexity of the activities. As tasks are combined into in-flight operations, they are subjected to time constraints and the crew enhances their skills through repetition. The science objectives must be completely understood by the crew and are critical to the overall training program. Completion of the in-flight activities is proof of success. Because the crew is exposed to the background of early research and plans for post-flight analyses, they have a vested interest in the flight activities. The salient features of this training approach is that it allows for flexibility in implementation, consideration of individual differences, and a greater ability to retain experiment information. This training approach offers another effective alternative training tool to existing methodologies. Author

N95-11970*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

MEETING THE CHALLENGE OF MANNED LUNAR AND MARTIAN EXPLORATION

REBECCA C. WILLIAMSON In its Technical Paper Contest for Women 1992. Space Challenges: Earth and Beyond p 195-205

1993

Avail: CASI HC A03/MF A03

As the U.S. space program plans for a return to the Lunar surface and ultimately for a mission to Mars, space units and portable life support systems will have to keep pace to meet the exploration mission requirements. The systems currently in use with the Shuttle program will not be adequate for exploration on the Martian surface or for extensive exploration and work on the Lunar surface. Currently, there are too many unknowns regarding locomotion and work physiology in reduced gravity to accurately design advanced suits and life support systems for routine extravehicular activity (EVA). It would be unwise and costly to arbitrarily develop new designs without first studying how the human body moves and works in these environments. This paper discusses the current state of the art of EVA space suit and PLSS design to meet the need of advanced exploration missions. Current research underway in the Extravehicular Systems Branch at Ames Research Center aimed at advanced system design is highlighted. Author

N95-12132*# Food and Agrosystems, Inc., Sunnyvale, CA. METHODOLOGIES FOR PROCESSING PLANT MATERIAL INTO ACCEPTABLE FOOD ON A SMALL SCALE

THOMAS R. PARKS, JOHN N. BINDON, ANTHONY J. G. BOWLES, PETER GOLBITZ, RAUNO A. LAMPI, and ROBERT F. MARQUARDT
Sep. 1994 258 p

(Contract(s)/Grant(s): NAS2-13404; SBIR-12.04-8450B)
(NASA-CR-177647; A-94130; NAS 1.26:177647) Avail: CASI HC A12/MF A03

Based on the Controlled Environment Life Support System (CELSS) production of only four crops, wheat, white potatoes, soybeans, and sweet potatoes; a crew size of twelve; a daily planting/harvesting regimen; and zero-gravity conditions, estimates were made on the quantity of food that would need to be grown to provide adequate nutrition; and the corresponding amount of biomass that would result. Projections were made of the various types of products that could be made from these crops, the unit operations that would be involved, and what menu capability these products could provide. Equipment requirements to perform these unit operations were screened to identify commercially available units capable of operating (or being modified to operate) under CELSS/zero-gravity conditions. Concept designs were developed for those equipment needs for which no suitable units were commercially available. Prototypes of selected concept designs were constructed and tested on a laboratory scale, as were selected commercially available units. This report discusses the practical considerations taken into account in the various design alternatives, some of the many product/process factors that relate to equipment development, and automation alternatives. Recommendations are made on both general and specific areas in which it was felt additional investigation would benefit CELSS missions. Author

N95-12354# Federal Aviation Administration, Oklahoma City, OK. Civil Aeromedical Inst.

SIMULTANEOUS GAS-CHROMATOGRAPHIC DETERMINATION OF FOUR TOXIC GASES GENERALLY PRESENT IN COMBUSTION ATMOSPHERES Final Report

BOYD R. ENDECOTT, DONALD C. SANDERS, and ARVIND K. CHATURVEDI
Sep. 1994 12 p

(DOT/FAA/AM-94/18) Avail: CASI HC A03/MF A01

Measurement of combustion gases produced by burning aircraft cabin materials poses a continuing limitation for smoke toxicity research. Since toxic effects of gases depend on both their concentrations and durations of exposures, frequent atmosphere sampling is necessary to define the concentration-time curve. A gas chromatographic method was developed for the simultaneous analyses of carbon monoxide (CO), hydrogen sulfide (H₂S), sulfur dioxide (SO₂), and hydrogen cyanide (HCN). The method utilized an MTI M200 dual-column gas chromatograph (GC) equipped with 4-m molecular sieve-5A and 8-m PoraPlot-U capillary columns and two low-volume, high sensitivity thermal conductivity detectors. Detectability (ppm)/retention times (seconds) for the gases were: CO (100/

28); H₂S (50/26); SO₂ (125/76); HCN (60/108). The method was effective for determining the gases in mixtures and in the combustion atmospheres generated by burning wool (CO, HCN, and H₂S) and modacrylic (CO and HCN) fabrics. Common atmospheric gaseous or combustion products (oxygen, carbon dioxide, nitrogen, water vapor, and other volatiles) did not interfere with the analyses. However, filtration of the combustion atmospheres was necessary to prevent restriction of the GC sampling inlet by smoke particulates. The speed, sensitivity, and selectivity of this method make it suitable for smoke toxicity research and for evaluating performance of passenger protective breathing equipment. Author

N95-12361*# Universities Space Research Association, Columbia, MD.

M.E.366-J EMBODIMENT DESIGN PROJECT: PORTABLE FOOT RESTRAINT

RANDALL HEATON, EIKAR MEYER, DAVEY SCHMIDT, and KEVIN ENDERS
25 Apr. 1994 49 p

(Contract(s)/Grant(s): NASW-4435)

(NASA-CR-197163; NAS 1.26:197163) Avail: CASI HC A03/MF A01

During space shuttle operations, astronauts require support to carry out tasks in the weightless environment. In the past, portable foot restraints (PFR) with orientations adjustable in pitch, roll, and yaw provided this support for payload bay operations. These foot restraints, however, were designed for specific tasks with a load limit of 111.2 Newtons. Since the original design, new applications for foot restraints have been identified. New designs for the foot restraints have been created to boost the operational work load to 444.8 Newtons and decrease setup times. What remains to be designed is an interface between the restraint system and the extravehicular mobility unit (EMU) boots. NASA provided a proposed locking device involving a spring-loaded mechanism. This locking mechanism must withstand loads of 1334.4 Newtons in any direction and weigh less than 222.4 Newtons. This paper develops an embodiment design for the interface between the PFR and the EMU boots. This involves design of the locking mechanism and a removable cleat that allows the boot to interface with this mechanism. The design team used the Paul Beitz engineering methodology to present the systematic development, structural analysis, and production considerations of the embodiment design. This methodology provides a basis for understanding the justification behind the decisions made in the design. Author

N95-12555*# Universities Space Research Association, Columbia, MD.

THE EMBODIMENT DESIGN OF THE HEAT REJECTION SYSTEM FOR THE PORTABLE LIFE SUPPORT SYSTEM

SUE STUCKWISCH, JASON FRANCOIS, JULIA LAUGHLIN, LEE PHILLIPS, and CARLOS A. CARRION
25 Apr. 1994 51 p

(Contract(s)/Grant(s): NASW-4435)

(NASA-CR-197178; NAS 1.26:197178) Avail: CASI HC A04/MF A01

The Portable Life Support System (PLSS) provides a suitable environment for the astronaut in the Extravehicular Mobility Unit (EMU), and the heat rejection system controls the thermal conditions in the space suit. The current PLSS sublimates water to the space environment; therefore, the system loses mass. Since additional supplies of fluid must be available on the Space Shuttle, NASA desires a closed heat rejecting system. This document presents the embodiment design for a radiative plate heat rejection system without mass transfer to the space environment. This project will transform the concept variant into a design complete with material selection, dimensions of the system, layouts of the heat rejection system, suggestions for manufacturing, and financial viability. Author

N95-12629*# Universities Space Research Association, Columbia, MD.

INTEGRAL HABITAT TRANSPORT SYSTEM

BILL ELLIOTT, SCOTT FRAZER, JOEY HIGGS, JASON HUFF, and

TIGREE MILAM 8 Mar. 1994 12 p
(Contract(s)/Grant(s): NASW-4435)
(NASA-CR-197156; NAS 1.26:197156) Avail: CASI HC A03/MF A01

In the 1993 Fall quarter, the ME 4182 design class was sponsored to study various scenarios that needed to be studied for Martian travel. The class was sponsored by NASA and there were several different design projects. The design that group three chose was an integral transport system for a Martian habitat. An integral transport system means the design had to be one that was attached to the habitat. There were several criteria that the design had to meet. Group three performed an in depth study of the Martian environment and looked at several different design ideas. The concept group three developed involved the use of kinematic linkages and the use of Martian gravity to move the habitat. The various design concepts, the criteria matrices and all other aspects that helped group three develop their design can be found in their 1993 ME 4182 design report. Now it is Winter quarter 1994 and group three is faced with another problem. The problem is building a working prototype of their Fall design. The limitations this quarter were the parts. The group had to make the prototype work with existing manufactured parts or make the parts themselves in a machine shop. The prototype was scaled down roughly about twelve times smaller than the original design. The following report describes the actions taken by group three to build a working model.

Derived from text

N95-13055 Army Aeromedical Research Lab., Fort Rucker, AL. STANDARDS RELEVANT TO A NATO ANTHROPOMETRY SURVEY USING 3D IMAGING TOOLS
JAMES E. BRUCKART Jun. 1994 20 p Limited Reproducibility:
More than 20% of this document may be affected by microfiche quality

(Contract(s)/Grant(s): DA PROJ. 301-62787-A-878)
(AD-A283065; USAARL-94-30) Avail: CASI HC A03

Designers of aircraft cockpits and aircrew equipment have long recognized the importance of accurate measurements of the flying population. The success of three dimensional anthropometry and its usability for design and fitting are dependent largely on the adoption of standards for digital image display, transformation, storage, and communication. Standards are required for image data obtained from surface or volumetric scanner systems, as well as reduced and analyzed data. There are hundreds of data formats already in use by various disciplines for all sorts of data. In this paper, we will discuss what is desired in a format for three dimensional biomedical image data and several formats already available.

DTIC

N95-13214*# Georgia Tech Research Inst., Atlanta, GA. EVALUATION OF CANDIDATE MILLIMETER WAVE SENSORS FOR SYNTHETIC VISION

NEAL T. ALEXANDER, BRIAN H. HUDSON, and JIM D. ECHARD
In NASA. Langley Research Center, Airborne Windshear Detection and Warning Systems. Fifth and Final Combined Manufacturers' and Technologists' Conference, Part 2 p 747-764 Jul. 1994
Avail: CASI HC A03/MF A04

The goal of the Synthetic Vision Technology Demonstration Program was to demonstrate and document the capabilities of current technologies to achieve safe aircraft landing, take off, and ground operation in very low visibility conditions. Two of the major thrusts of the program were (1) sensor evaluation in measured weather conditions on a tower overlooking an unused airfield and (2) flight testing of sensor and pilot performance via a prototype system. The presentation first briefly addresses the overall technology thrusts and goals of the program and provides a summary of MMW sensor tower-test and flight-test data collection efforts. Data analysis and calibration procedures for both the tower tests and flight tests are presented. The remainder of the presentation addresses the MMW sensor flight-test evaluation results, including the processing approach for determination of various performance metrics (e.g., contrast, sharpness, and variability). The variation of the very important contrast metric in adverse weather conditions is de-

scribed. Design trade-off considerations for Synthetic Vision MMW sensors are presented.
Author (revised)

55

SPACE BIOLOGY

Includes exobiology; planetary biology; and extraterrestrial life.

N95-13026*# Georgia Inst. of Tech., Atlanta, GA. School of Electrical and Computer Engineering.

SEARCH FOR EXTRATERRESTRIAL INTELLIGENCE/HIGH RESOLUTION MICROWAVE SURVEY TEAM MEMBER Final Report, 1 Mar. 1991 - 31 Aug. 1994

PAUL G. STEFFES 1994 21 p

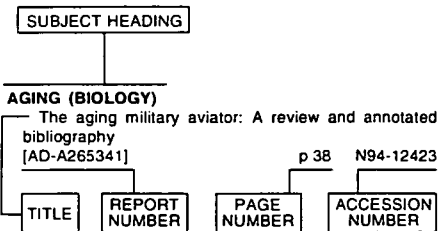
(Contract(s)/Grant(s): NAG2-700)

(NASA-CR-196478; NAS 1.26:196478) Avail: CASI HC A03/MF A01

This final report summarizes activities conducted during the three years of the NASA High Resolution Microwave Survey (HRMS). With primary interest in the Sky Survey activity, the principal investigator attended nine Working Group meetings and traveled independently to conduct experiments or present results at other meetings. The major activity involved evaluating the effects of spaceborne radio frequency interference (RFI) on both the SETI sky survey and targeted search. The development of a database of all unclassified earth or biting and deep space transmitters, along with accompanying search software, was a key accomplishment. The software provides information about potential sources of interference and gives complete information regarding the frequencies, positions and levels of interference generated by the spacecraft. A complete description of this search system (called HRS, or HRMS RFI Search) is provided. Other accomplishments include development of a 32,000 channel Fast-Fourier-Transform Spectrum analyzer for use in studies of interference from satellites and in a 1.4 mm SETI observational study. The latest revision of HRS has now been distributed to the extended radio astronomy and SETI community.

Author (revised)

Typical Subject Index Listing



The subject heading is a key to the subject content of the document. The title is used to provide a description of the subject matter. When the title is insufficiently descriptive of document content, a title extension is added, separated from the title by three hyphens. The accession number and the page number are included in each entry to assist the user in locating the abstract in the abstract section. If applicable, a report number is also included as an aid in identifying the document. Under any one subject heading, the accession numbers are arranged in sequence.

A

- ABSTRACTS**
Abstracts from the International Conference on Nuclear Analytical Methods in the Life Sciences
[DE94-621923] p 27 N95-11728
- ACCELERATION**
Vestibular afferent responses to linear accelerations in the alert squirrel monkey
[NASA-TM-4581] p 28 N95-12006
- ACOUSTIC PROPERTIES**
Ultrasound laser pulse effects in ocular and related media: Laser-induced shock wave propagation and retinal damage
[AD-A282599] p 32 N95-12535
- ACTIVITY (BIOLOGY)**
Vestibular afferent responses to linear accelerations in the alert squirrel monkey
[NASA-TM-4581] p 28 N95-12006
- ACTIVITY CYCLES (BIOLOGY)**
Particle method for population waves
[BTN-94-EIX94341340324] p 27 A95-60860
- AEROSOLS**
Acute inhalation of explosively disseminated carbon fibers in rats
[AD-A280556] p 29 N95-12614
- AEROSPACE MEDICINE**
Elimination of quinine in two subjects after ingestion of tonic water: An exploratory study
[DOT/FAA/AM-94/16] p 31 N95-11702
Effects of oral glucose on exercise thermoregulation in men after water immersion
[NASA-TM-108825] p 28 N95-11810
Psychophysiological assessment methods (including a register of psychophysiologicals on microfiches)
[AGARD-AR-324] p 34 N95-12133
Spaceflight and immune responses of Rhesus monkeys
[NASA-CR-196846] p 29 N95-12941

- Age 60 Rule research. Part 1: Bibliographic database
[DOT/FAA/AM-94/20-PT-1] p 35 N95-13019
Age 60 Rule. Part 2: Airline pilot age and performance. A review of the scientific literature
[DOT/FAA/AM-94/21-PT-2] p 35 N95-13020
Aviation epidemiology data register: Cardiovascular disease screening outcomes in the North Dakota Army National Guard aviator cohort
[AD-A283064] p 33 N95-13054
Aerospace medicine and biology: A continuing bibliography with indexes (supplement 394)
[NASA-SP-7011(394)] p 34 N95-13230
- AFFERENT NERVOUS SYSTEMS**
Vestibular afferent responses to linear accelerations in the alert squirrel monkey
[NASA-TM-4581] p 28 N95-12006
- AGE FACTOR**
Age 60 Rule research. Part 1: Bibliographic database
[DOT/FAA/AM-94/20-PT-1] p 35 N95-13019
Age 60 Rule. Part 2: Airline pilot age and performance. A review of the scientific literature
[DOT/FAA/AM-94/21-PT-2] p 35 N95-13020
- AGING (BIOLOGY)**
Age 60 Rule research. Part 1: Bibliographic database
[DOT/FAA/AM-94/20-PT-1] p 35 N95-13019
Age 60 Rule. Part 2: Airline pilot age and performance. A review of the scientific literature
[DOT/FAA/AM-94/21-PT-2] p 35 N95-13020
Age 60 study. Part 4: Experimental evaluation of pilot performance
[REPT-8025-4B] p 35 N95-13199
- AIR FLOW**
A numerical analysis of the distribution of stresses in lung parenchyma which accounts for the interactions between the tissue skeleton and flowing air
p 31 N95-11806
- AIR SAMPLING**
Simultaneous gas-chromatographic determination of four toxic gases generally present in combustion atmospheres
[DOT/FAA/AM-94/18] p 38 N95-12354
- AIRCRAFT ACCIDENTS**
Elimination of quinine in two subjects after ingestion of tonic water: An exploratory study
[DOT/FAA/AM-94/16] p 31 N95-11702
Age 60 Rule. Part 2: Airline pilot age and performance. A review of the scientific literature
[DOT/FAA/AM-94/21-PT-2] p 35 N95-13020
- AIRCRAFT COMPARTMENTS**
Simultaneous gas-chromatographic determination of four toxic gases generally present in combustion atmospheres
[DOT/FAA/AM-94/18] p 38 N95-12354
- AIRCRAFT HAZARDS**
Evaluation of candidate millimeter wave sensors for synthetic vision
p 39 N95-13214
- AIRCRAFT LANDING**
Evaluation of candidate millimeter wave sensors for synthetic vision
p 39 N95-13214
- AIRCRAFT PILOTS**
Age 60 Rule research. Part 1: Bibliographic database
[DOT/FAA/AM-94/20-PT-1] p 35 N95-13019
Age 60 Rule. Part 2: Airline pilot age and performance. A review of the scientific literature
[DOT/FAA/AM-94/21-PT-2] p 35 N95-13020
Aviation epidemiology data register: Cardiovascular disease screening outcomes in the North Dakota Army National Guard aviator cohort
[AD-A283064] p 33 N95-13054
- AIRCRAFT SAFETY**
Simultaneous gas-chromatographic determination of four toxic gases generally present in combustion atmospheres
[DOT/FAA/AM-94/18] p 38 N95-12354
- AIRPORTS**
Evaluation of candidate millimeter wave sensors for synthetic vision
p 39 N95-13214
- ALERTNESS**
Crew factors in flight operations 9: Effects of planned cockpit rest on crew performance and alertness in long-haul operations
[NASA-TM-108839] p 33 N95-12792

- ALKALOIDS**
Elimination of quinine in two subjects after ingestion of tonic water: An exploratory study
[DOT/FAA/AM-94/16] p 31 N95-11702
- ALTERNATIVES**
Methodologies for processing plant material into acceptable food on a small scale
[NASA-CR-177647] p 38 N95-12132
- ALVEOLI**
A numerical analysis of the distribution of stresses in lung parenchyma which accounts for the interactions between the tissue skeleton and flowing air
p 31 N95-11806
- AMINO ACIDS**
Rational enzyme redesign
[DE94-014565] p 29 N95-12677
- AMPLIFICATION**
Microbial communities in subsurface environments: Diversity, origin, and evolution
[DE94-013699] p 27 N95-11737
- ANCHORS (FASTENERS)**
M.E.366-J embodiment design project: Portable foot restraint
[NASA-CR-197163] p 38 N95-12361
- ANTHROPOMETRY**
Biomedical imaging
[AD-A282221] p 32 N95-12405
Standards relevant to a NATO anthropometry survey using 3D imaging tools
[AD-A283065] p 39 N95-13055
- APOLLO PROJECT**
Interviews with the Apollo lunar surface astronauts in support of planning for EVA systems design
[NASA-TM-108846] p 37 N95-11905
- ARCHAEBACTERIA**
On the isolation of halophilic microorganisms from salt deposits of great geological age
p 28 N95-11966
- ASCORBIC ACID**
Copper metabolism in rats fed ascorbic acid or restricted amounts of copper
[PB94-191343] p 28 N95-11902
- ASTRONAUT LOCOMOTION**
Human factors assessments of the STS-57 SpaceHab-1 mission
[NASA-TM-104802] p 36 N95-11878
- ASTRONAUT MANEUVERING EQUIPMENT**
Interviews with the Apollo lunar surface astronauts in support of planning for EVA systems design
[NASA-TM-108846] p 37 N95-11905
- ASTRONAUT PERFORMANCE**
Human factors assessments of the STS-57 SpaceHab-1 mission
[NASA-TM-104802] p 36 N95-11878
- ASTRONAUT TRAINING**
Training for life science experiments in space at the NASA Ames Research Center
p 37 N95-11964
- ASTRONAUTS**
Interviews with the Apollo lunar surface astronauts in support of planning for EVA systems design
[NASA-TM-108846] p 37 N95-11905
- ASYMPTOTIC PROPERTIES**
Competition in the chemostat: Global asymptotic behavior of a model with delayed response in growth
[BTN-94-EIX94341340323] p 27 A95-60859
- AUDITORY PERCEPTION**
Effects of Noise on Hearing 5th International Symposium
[AD-A281439] p 33 N95-13177
- AVIATION PSYCHOLOGY**
Crew factors in flight operations 9: Effects of planned cockpit rest on crew performance and alertness in long-haul operations
[NASA-TM-108839] p 33 N95-12792

B

- BACTERIA**
Particle method for population waves
[BTN-94-EIX94341340324] p 27 A95-60860

- Conformation of membrane proteins:
Bacteriorhodopsin
[AD-A281282] p 30 N95-13373
- BACTERIOLOGY**
Competition in the chemostat: Global asymptotic behavior of a model with delayed response in growth
[BTN-94-EIX94341340323] p 27 A95-60859
On the isolation of halophilic microorganisms from salt deposits of great geological age p 28 N95-11966
- BIBLIOGRAPHIES**
Age 60 Rule research. Part 1: Bibliographic database
[DOT/FAA/AM-94/20-PT-1] p 35 N95-13019
- BINOCLULAR VISION**
Coordinated action in 3-D space
[AD-A281284] p 35 N95-13375
- BIOASTRONAUTICS**
Meeting the nation's needs for biomedical and behavioral scientists
[LC-94-66477] p 28 N95-12310
Reduction of ocular counter-rolling by adaptation to space
[NASA-CR-196279] p 32 N95-12376
- BIOCHEMICAL OXYGEN DEMAND**
Consequences of prolonged inhalation of ozone on Fischer-344/N rats: Collaborative studies. Part 1: Content and cross-linking of lung collagen
[PB94-182748] p 30 N95-13176
- BIOCHEMISTRY**
Copper metabolism in rats fed ascorbic acid or restricted amounts of copper
[PB94-191343] p 28 N95-11902
- BIODYNAMICS**
Inhibition-produced patterning in chains of coupled nonlinear oscillators
[BTN-94-EIX94341340325] p 27 A95-60861
Preconditioning electromyographic data for an upper extremity model using neural networks
[NASA-CR-196877] p 31 N95-11708
- BIOELECTRICITY**
Modelling of biopotential recordings and its implications for instrumentation design
[PB94-206844] p 30 N95-13408
- BIOLOGICAL EFFECTS**
Radiofrequency/microwave radiation biological effects and safety standards: A review
[AD-A282886] p 33 N95-12919
- BIOLOGICAL MODELS (MATHEMATICS)**
A numerical analysis of the distribution of stresses in lung parenchyma which accounts for the interactions between the tissue skeleton and flowing air p 31 N95-11806
- BIOMEDICAL DATA**
Standards relevant to a NATO anthropometry survey using 3D imaging tools
[AD-A283065] p 39 N95-13055
Modelling of biopotential recordings and its implications for instrumentation design
[PB94-206844] p 30 N95-13408
- BIOSYNTHESIS**
Rational enzyme redesign
[DE94-014565] p 29 N95-12677
- BLOOD CIRCULATION**
Effect of decreased gravity on circulation in the rat
[NASA-CR-196946] p 29 N95-12827
- BLOOD FLOW**
Effect of decreased gravity on circulation in the rat
[NASA-CR-196946] p 29 N95-12827
- BLOOD PRESSURE**
Effect of decreased gravity on circulation in the rat
[NASA-CR-196946] p 29 N95-12827
- BLOOD VOLUME**
Effect of decreased gravity on circulation in the rat
[NASA-CR-196946] p 29 N95-12827
- BONE MARROW**
Spaceflight and immune responses of Rhesus monkeys
[NASA-CR-196846] p 29 N95-12941
- BRAIN**
How are three-dimensional objects represented in the brain?
[AD-A282367] p 34 N95-11942
- BREATHING APPARATUS**
Simultaneous gas-chromatographic determination of four toxic gases generally present in combustion atmospheres
[DOT/FAA/AM-94/18] p 38 N95-12354
- BRONCHI**
Acute inhalation of explosively disseminated carbon fibers in rats
[AD-A280556] p 29 N95-12614

C

- CANCER**
Morphological differentiation of colon carcinoma cell lines in rotating wall vessels
[NASA-CR-196780] p 31 N95-11808
- CARBON DIOXIDE**
Carbon dioxide and water vapor production at rest and during exercise. A report on data collection for the Crew and Thermal Systems Division
[NASA-TP-3500] p 36 N95-11811
Regulation of alternative CO₂ fixation pathways in prokaryotic and eukaryotic photosynthetic organisms
[DE94-013180] p 30 N95-13271
- CARBON FIBERS**
Acute inhalation of explosively disseminated carbon fibers in rats
[AD-A280556] p 29 N95-12614
- CARDIOVASCULAR SYSTEM**
Aviation epidemiology data register: Cardiovascular disease screening outcomes in the North Dakota Army National Guard aviator cohort
[AD-A283064] p 33 N95-13054
- CATHODE RAY TUBES**
Dynamic sine wave response measurements of CRT displays using sinusoidal counterphase modulation
[AD-A282222] p 32 N95-12406
- CELL DIVISION**
Mammalian cell cultivation in space p 27 A95-61564
Morphological differentiation of colon carcinoma cell lines in rotating wall vessels
[NASA-CR-196780] p 31 N95-11808
- CELLS (BIOLOGY)**
Particle method for population waves
[BTN-94-EIX94341340324] p 27 A95-60860
- CENTRIFUGES**
Life Sciences Centrifuge Facility assessment
[NASA-CR-196848] p 30 N95-13423
- CHAINS**
Inhibition-produced patterning in chains of coupled nonlinear oscillators
[BTN-94-EIX94341340325] p 27 A95-60861
- CHRONIC CONDITIONS**
Consequences of prolonged inhalation of ozone on Fischer-344/N rats: Collaborative studies. Part 1: Content and cross-linking of lung collagen
[PB94-182748] p 30 N95-13176
- CLOSED ECOLOGICAL SYSTEMS**
Growth of potatoes for CELSS
[NASA-CR-177646] p 37 N95-11949
Techniques for optimal crop selection in a controlled ecological life support system p 37 N95-11962
Methodologies for processing plant material into acceptable food on a small scale
[NASA-CR-177647] p 38 N95-12132
- CLOTHING**
Body dimensions for apparel
[PB94-187739] p 37 N95-11908
- COLLAGENS**
Consequences of prolonged inhalation of ozone on Fischer-344/N rats: Collaborative studies. Part 1: Content and cross-linking of lung collagen
[PB94-182748] p 30 N95-13176
- COLOR VISION**
Visit to UDRI and USAF, Armstrong Lab., Williams AFB, Phoenix, USA, February 8-11, 1993
[PB94-190659] p 36 N95-11873
- COMBUSTION PRODUCTS**
Simultaneous gas-chromatographic determination of four toxic gases generally present in combustion atmospheres
[DOT/FAA/AM-94/18] p 38 N95-12354
- COMPUTATIONAL FLUID DYNAMICS**
A numerical analysis of the distribution of stresses in lung parenchyma which accounts for the interactions between the tissue skeleton and flowing air p 31 N95-11806
- COMPUTER PROGRAMS**
A numerical analysis of the distribution of stresses in lung parenchyma which accounts for the interactions between the tissue skeleton and flowing air p 31 N95-11806
- COMPUTER TECHNIQUES**
Scene analysis: A brief survey
[PB94-205085] p 36 N95-13433
- COMPUTER VISION**
Scene analysis: A brief survey
[PB94-205085] p 36 N95-13433
- COMPUTERIZED SIMULATION**
A musculoskeletal model of the elbow joint complex
[NASA-CR-195812] p 34 N95-13270
- CONFERENCES**
Abstracts from the International Conference on Nuclear Analytical Methods in the Life Sciences
[DE94-621923] p 27 N95-11728

- Summary of the Sixteenth Annual Conference on Shock
[AD-A282643] p 32 N95-12542
Effects of Noise on Hearing 5th International Symposium
[AD-A281439] p 33 N95-13177
- CONSTRAINTS**
M.E.366-J embodiment design project: Portable foot restraint
[NASA-CR-197163] p 38 N95-12361
- CONTROLLED ATMOSPHERES**
Methodologies for processing plant material into acceptable food on a small scale
[NASA-CR-177647] p 38 N95-12132
- COOLING SYSTEMS**
The embodiment design of the heat rejection system for the portable life support system
[NASA-CR-197178] p 38 N95-12555
- COPPER**
Copper metabolism in rats fed ascorbic acid or restricted amounts of copper
[PB94-191343] p 28 N95-11902
- COUPLING**
Inhibition-produced patterning in chains of coupled nonlinear oscillators
[BTN-94-EIX94341340325] p 27 A95-60861
- CREW PROCEDURES (INFLIGHT)**
Age 60 study. Part 4: Experimental evaluation of pilot performance
[REPT-8025-4B] p 35 N95-13199
- CREWS**
Tank crew performance related to cognitive ability and motivation of the tank crew members
[PB94-190642] p 34 N95-11872
- CROP GROWTH**
Growth of potatoes for CELSS
[NASA-CR-177646] p 37 N95-11949
- CULTURE TECHNIQUES**
Competition in the chemostat: Global asymptotic behavior of a model with delayed response in growth
[BTN-94-EIX94341340323] p 27 A95-60859
Particle method for population waves
[BTN-94-EIX94341340324] p 27 A95-60860
Morphological differentiation of colon carcinoma cell lines in rotating wall vessels
[NASA-CR-196780] p 31 N95-11808
- CYTOLOGY**
Morphological differentiation of colon carcinoma cell lines in rotating wall vessels
[NASA-CR-196780] p 31 N95-11808

D

- DAMAGE ASSESSMENT**
Ultrasound/laser pulse effects in ocular and related media: Laser-induced shock wave propagation and retinal damage
[AD-A282599] p 32 N95-12535
- DATA ACQUISITION**
Biomedical imaging
[AD-A282221] p 32 N95-12405
- DATA PROCESSING**
Standards relevant to a NATO anthropometry survey using 3D imaging tools
[AD-A283065] p 39 N95-13055
- DATA TRANSMISSION**
Modelling of biopotential recordings and its implications for instrumentation design
[PB94-206844] p 30 N95-13408
- DEOXYRIBONUCLEIC ACID**
Microbial communities in subsurface environments: Diversity, origin, and evolution
[DE94-013699] p 27 N95-11737
- DIAMETERS**
Acute inhalation of explosively disseminated carbon fibers in rats
[AD-A280556] p 29 N95-12614
- DIETS**
Copper metabolism in rats fed ascorbic acid or restricted amounts of copper
[PB94-191343] p 28 N95-11902
- DIFFERENTIATION (BIOLOGY)**
Morphological differentiation of colon carcinoma cell lines in rotating wall vessels
[NASA-CR-196780] p 31 N95-11808
- DIMENSIONAL MEASUREMENT**
Body dimensions for apparel
[PB94-187739] p 37 N95-11908
- DISPLAY DEVICES**
Visit to UDRI and USAF, Armstrong Lab., Williams AFB, Phoenix, USA, February 8-11, 1993
[PB94-190659] p 36 N95-11873
Dynamic sine wave response measurements of CRT displays using sinusoidal counterphase modulation
[AD-A282222] p 32 N95-12406

DYNAMIC RESPONSE

Dynamic sine wave response measurements of CRT displays using sinusoidal counterphase modulation
[AD-A282222] p 32 N95-12406

DYNAMIC TESTS

Vestibular afferent responses to linear accelerations in the alert squirrel monkey
[NASA-TM-4581] p 28 N95-12006

E

ELASTIC DEFORMATION

A numerical analysis of the distribution of stresses in lung parenchyma which accounts for the interactions between the tissue skeleton and flowing air
p 31 N95-11806

ELBOW (ANATOMY)

A musculoskeletal model of the elbow joint complex
[NASA-CR-195812] p 34 N95-13270

ELECTRIC PULSES

Inhibition-produced patterning in chains of coupled nonlinear oscillators
[BTN-94-EIX94341340325] p 27 A95-60861

ELECTROCARDIOGRAPHY

Modelling of biopotential recordings and its implications for instrumentation design
[PB94-206844] p 30 N95-13408

ELECTRODES

Modelling of biopotential recordings and its implications for instrumentation design
[PB94-206844] p 30 N95-13408

ELECTROENCEPHALOGRAPHY

Modelling of biopotential recordings and its implications for instrumentation design
[PB94-206844] p 30 N95-13408

ELECTROMYOGRAPHY

Preconditioning electromyographic data for an upper extremity model using neural networks
[NASA-CR-196877] p 31 N95-11708

ELECTROPHYSIOLOGY

Modelling of biopotential recordings and its implications for instrumentation design
[PB94-206844] p 30 N95-13408

EMOTIONAL FACTORS

Tank crew performance related to cognitive ability and motivation of the tank crew members
[PB94-190642] p 34 N95-11872

ENGINEERING

JPRS report: Science and technology. Central Eurasia: Life sciences
[JPRS-ULS-93-012] p 31 N95-11744

ENVIRONMENTAL CONTROL

Carbon dioxide and water vapor production at rest and during exercise. A report on data collection for the Crew and Thermal Systems Division
[NASA-TP-3500] p 36 N95-11811

ENZYMES

Rational enzyme redesign
[DE94-014565] p 29 N95-12677

EPIDEMIOLOGY

Aviation epidemiology data register: Cardiovascular disease screening outcomes in the North Dakota Army National Guard aviator cohort
[AD-A283064] p 33 N95-13054

EPITHELIUM

Morphological differentiation of colon carcinoma cell lines in rotating wall vessels
[NASA-CR-196780] p 31 N95-11808

EQUIPMENT SPECIFICATIONS

Methodologies for processing plant material into acceptable food on a small scale
[NASA-CR-177647] p 38 N95-12132

ERGOMETERS

Comparison of submaximal cycling and treadmill exercise at similar work rates
[AD-A283430] p 33 N95-12593

ESTIMATES

Meeting the nation's needs for biomedical and behavioral scientists
[LC-94-66477] p 28 N95-12310

EUKARYOTES

Regulation of alternative CO₂ fixation pathways in prokaryotic and eukaryotic photosynthetic organisms
[DE94-013180] p 30 N95-13271

EXERCISE PHYSIOLOGY

Carbon dioxide and water vapor production at rest and during exercise. A report on data collection for the Crew and Thermal Systems Division
[NASA-TP-3500] p 36 N95-11811

EXOBIOLGY

Aerospace medicine and biology: A continuing bibliography with indexes (supplement 394)
[NASA-SP-7011(394)] p 34 N95-13230

EXPERIENCE

Age 60 study. Part 4: Experimental evaluation of pilot performance
[REPT-8025-4B] p 35 N95-13199

EXPERT SYSTEMS

Design issues of human operator support systems
[PB94-191376] p 36 N95-11778

EXPOSURE

Simultaneous gas-chromatographic determination of four toxic gases generally present in combustion atmospheres
[DOT/FAA/AM-94/18] p 38 N95-12354

Radiofrequency/microwave radiation biological effects and safety standards: A review
[AD-A282886] p 33 N95-12919

EXTRATERRESTRIAL INTELLIGENCE

Search for extraterrestrial intelligence/High Resolution Microwave Survey team member
[NASA-CR-196478] p 39 N95-13026

EXTRAVEHICULAR ACTIVITY

Evaluation of COSTAR mass handling characteristics in an environment. A simulation of the Hubble Space Telescope service mission
[NASA-TP-3489] p 32 N95-11887

Interviews with the Apollo lunar surface astronauts in support of planning for EVA systems design
[NASA-TM-108846] p 37 N95-11905

Meeting the challenge of manned lunar and Martian exploration
p 37 N95-11970

EXTRAVEHICULAR MOBILITY UNITS

M.E.366-J embodiment design project: Portable foot restraint
[NASA-CR-197163] p 38 N95-12361

The embodiment design of the heat rejection system for the portable life support system
[NASA-CR-197178] p 38 N95-12555

EYE (ANATOMY)

Scene analysis: A brief survey
[PB94-205085] p 36 N95-13433

EYE MOVEMENTS

Visual psychophysics of egomotion
[AD-A282547] p 35 N95-12495

Coordinated action in 3-D space
[AD-A281284] p 35 N95-13375

F

FARM CROPS

Techniques for optimal crop selection in a controlled ecological life support system
p 37 N95-11962

Methodologies for processing plant material into acceptable food on a small scale
[NASA-CR-177647] p 38 N95-12132

FIBROSIS

Consequences of prolonged inhalation of ozone on Fischer-344/N rats: Collaborative studies. Part 1: Content and cross-linking of lung collagen
[PB94-182748] p 30 N95-13176

FITTING

Body dimensions for apparel
[PB94-187739] p 37 N95-11908

FLIGHT CREWS

Visit to UDRI and USAF, Armstrong Lab., Williams AFB, Phoenix, USA, February 8-11, 1993
[PB94-190659] p 36 N95-11873

Crew factors in flight operations 9: Effects of planned cockpit rest on crew performance and alertness in long-haul operations
[NASA-TM-108839] p 33 N95-12792

Aviation epidemiology data register: Cardiovascular disease screening outcomes in the North Dakota Army National Guard aviator cohort
[AD-A283064] p 33 N95-13054

Standards relevant to a NATO anthropometry survey using 3D imaging tools
[AD-A283065] p 39 N95-13055

FLIGHT FATIGUE

Crew factors in flight operations 9: Effects of planned cockpit rest on crew performance and alertness in long-haul operations
[NASA-TM-108839] p 33 N95-12792

FLIGHT OPERATIONS

Crew factors in flight operations 9: Effects of planned cockpit rest on crew performance and alertness in long-haul operations
[NASA-TM-108839] p 33 N95-12792

FLIGHT SAFETY

Age 60 Rule research. Part 1: Bibliographic database
[DOT/FAA/AM-94/20-PT-1] p 35 N95-13019

Age 60 Rule. Part 2: Airline pilot age and performance. A review of the scientific literature
[DOT/FAA/AM-94/21-PT-2] p 35 N95-13020

FLIGHT SIMULATION

Visit to UDRI and USAF, Armstrong Lab., Williams AFB, Phoenix, USA, February 8-11, 1993
[PB94-190659] p 36 N95-11873

FLIGHT SIMULATORS

Age 60 study. Part 4: Experimental evaluation of pilot performance
[REPT-8025-4B] p 35 N95-13199

FOOD PRODUCTION (IN SPACE)

Growth of potatoes for CELSS
[NASA-CR-177646] p 37 N95-11949

Techniques for optimal crop selection in a controlled ecological life support system
p 37 N95-11962

FOREARM

A musculoskeletal model of the elbow joint complex
[NASA-CR-195812] p 34 N95-13270

G

GANGLIA

Neural networks: Structure and repair. Part 1: Ground squirrel visual system. Part 2: Formation, maintenance and plasticity of synaptic connections
[AD-A282420] p 29 N95-12393

GAS ANALYSIS

Simultaneous gas-chromatographic determination of four toxic gases generally present in combustion atmospheres
[DOT/FAA/AM-94/18] p 38 N95-12354

GAS CHROMATOGRAPHY

Simultaneous gas-chromatographic determination of four toxic gases generally present in combustion atmospheres
[DOT/FAA/AM-94/18] p 38 N95-12354

GENERAL OVERVIEWS

Radiofrequency/microwave radiation biological effects and safety standards: A review
[AD-A282886] p 33 N95-12919

GLUCOSE

Effects of oral glucose on exercise thermoregulation in men after water immersion
[NASA-TM-108825] p 28 N95-11810

GRAVITATIONAL EFFECTS

Mammalian cell cultivation in space
p 27 A95-61564

GRAVITATIONAL PHYSIOLOGY

Effect of decreased gravity on circulation in the rat
[NASA-CR-196946] p 29 N95-12827

GROWTH

Competition in the chemostat: Global asymptotic behavior of a model with delayed response in growth
[BTN-94-EIX94341340323] p 27 A95-60859

H

HALOPHILES

Conformation of membrane proteins: Bacteriorhodopsin
[AD-A281282] p 30 N95-13373

HEAD DOWN TILT

Effect of decreased gravity on circulation in the rat
[NASA-CR-196946] p 29 N95-12827

HEAD MOVEMENT

Reduction of ocular counter-rolling by adaptation to space
[NASA-CR-196279] p 32 N95-12376

Coordinated action in 3-D space
[AD-A281284] p 35 N95-13375

HEARING

Effects of Noise on Hearing 5th International Symposium
[AD-A281439] p 33 N95-13177

HEART DISEASES

Aviation epidemiology data register: Cardiovascular disease screening outcomes in the North Dakota Army National Guard aviator cohort
[AD-A283064] p 33 N95-13054

HEART RATE

Effect of decreased gravity on circulation in the rat
[NASA-CR-196946] p 29 N95-12827

HEMODYNAMIC RESPONSES

Effect of decreased gravity on circulation in the rat
[NASA-CR-196946] p 29 N95-12827

HIGH STRENGTH

Acute inhalation of explosively disseminated carbon fibers in rats
[AD-A280556] p 29 N95-12614

HISTOCHEMICAL ANALYSIS

Morphological differentiation of colon carcinoma cell lines in rotating wall vessels
[NASA-CR-196780] p 31 N95-11808

HUBBLE SPACE TELESCOPE

Evaluation of COSTAR mass handling characteristics in an environment. A simulation of the Hubble Space Telescope service mission
[NASA-TP-3489] p 32 N95-11887

HUMAN BEINGS

Body dimensions for apparel
[PB94-187739] p 37 N95-11908

HUMAN BODY

Biomedical imaging
[AD-A282221] p 32 N95-12405

HUMAN FACTORS ENGINEERING

Design issues of human operator support systems
[PB94-191376] p 36 N95-11778

Human factors assessments of the STS-57 SpaceHab-1 mission
[NASA-TM-104802] p 36 N95-11878

Interviews with the Apollo lunar surface astronauts in support of planning for EVA systems design
[NASA-TM-108846] p 37 N95-11905

M.E.366-J embodiment design project: Portable foot restraint
[NASA-CR-197163] p 38 N95-12361

Visual psychophysics of egomotion
[AD-A282547] p 35 N95-12495

Coordinated action in 3-D space
[AD-A281284] p 35 N95-13375

HUMAN PERFORMANCE

Tank crew performance related to cognitive ability and motivation of the tank crew members
[PB94-190642] p 34 N95-11872

HUMAN RESOURCES

Visit to UDRI and USAF, Armstrong Lab., Williams AFB, Phoenix, USA, February 8-11, 1993
[PB94-190659] p 36 N95-11873

HUMAN TOLERANCES

Effects of Noise on Hearing 5th International Symposium
[AD-A281439] p 33 N95-13177

HYPOKINESIA

Effect of decreased gravity on circulation in the rat
[NASA-CR-196946] p 29 N95-12827

IMAGE ANALYSIS

Scene analysis: A brief survey
[PB94-205085] p 36 N95-13433

IMAGE MOTION COMPENSATION

Visual psychophysics of egomotion
[AD-A282547] p 35 N95-12495

IMAGE PROCESSING

Visual psychophysics of egomotion
[AD-A282547] p 35 N95-12495

Standards relevant to a NATO anthropometry survey using 3D imaging tools
[AD-A283065] p 39 N95-13055

IMAGE RESOLUTION

Dynamic sine wave response measurements of CRT displays using sinusoidal counterphase modulation
[AD-A282222] p 32 N95-12406

IMAGING TECHNIQUES

Biomedical imaging
[AD-A282221] p 32 N95-12405

IMMUNOLOGY

Spaceflight and immune responses of Rhesus monkeys
[NASA-CR-196846] p 29 N95-12941

INFECTIOUS DISEASES

Spaceflight and immune responses of Rhesus monkeys
[NASA-CR-196846] p 29 N95-12941

INFORMATION PROCESSING (BIOLOGY)

How are three-dimensional objects represented in the brain?
[AD-A282367] p 34 N95-11942

INFORMATION SYSTEMS

Abstracts from the International Conference on Nuclear Analytical Methods in the Life Sciences
[DE94-621923] p 27 N95-11728

INHIBITION

Inhibition-produced patterning in chains of coupled nonlinear oscillators
[BTN-94-EIX94341340325] p 27 A95-60861

INTESTINES

Morphological differentiation of colon carcinoma cell lines in rotating wall vessels
[NASA-CR-196780] p 31 N95-11808

INTRAHEMICULAR ACTIVITY

Human factors assessments of the STS-57 SpaceHab-1 mission
[NASA-TM-104802] p 36 N95-11878

K

KINETIC ENERGY

Particle method for population waves
[BTN-94-EIX94341340324] p 27 A95-60860

L

LASER APPLICATIONS

Ultrashort laser pulse effects in ocular and related media: Laser-induced shock wave propagation and retinal damage
[AD-A282599] p 32 N95-12535

LIFE SCIENCES

Abstracts from the International Conference on Nuclear Analytical Methods in the Life Sciences
[DE94-621923] p 27 N95-11728

JPRS report: Science and technology. Central Eurasia: Life sciences
[JPRS-ULS-93-012] p 31 N95-11744

Aerospace medicine and biology: A continuing bibliography with indexes (supplement 394)
[NASA-SP-7011(394)] p 34 N95-13230

Life Sciences Centrifuge Facility assessment
[NASA-CR-196848] p 30 N95-13423

LIFE SUPPORT SYSTEMS

Methodologies for processing plant material into acceptable food on a small scale
[NASA-CR-177647] p 38 N95-12132

Aerospace medicine and biology: A continuing bibliography with indexes (supplement 394)
[NASA-SP-7011(394)] p 34 N95-13230

LIGNIN

Rational enzyme redesign
[DE94-014565] p 29 N95-12677

LOW VISIBILITY

Evaluation of candidate millimeter wave sensors for synthetic vision
p 39 N95-13214

LUNAR EXPLORATION

Interviews with the Apollo lunar surface astronauts in support of planning for EVA systems design
[NASA-TM-108846] p 37 N95-11905

Meeting the challenge of manned lunar and Martian exploration
p 37 N95-11970

LUNG MORPHOLOGY

A numerical analysis of the distribution of stresses in lung parenchyma which accounts for the interactions between the tissue skeleton and flowing air
p 31 N95-11806

LUNGS

Consequences of prolonged inhalation of ozone on Fischer-344/N rats: Collaborative studies. Part 1: Content and cross-linking of lung collagen
[PB94-182748] p 30 N95-13176

M

MALES

Effects of oral glucose on exercise thermoregulation in men after water immersion
[NASA-TM-108825] p 28 N95-11810

Age 60 study. Part 4: Experimental evaluation of pilot performance
[REPT-8025-4B] p 35 N95-13199

MAMMALS

Mammalian cell cultivation in space
p 27 A95-61564

MAN MACHINE SYSTEMS

Design issues of human operator support systems
[PB94-191376] p 36 N95-11778

Aerospace medicine and biology: A continuing bibliography with indexes (supplement 394)
[NASA-SP-7011(394)] p 34 N95-13230

MANNED MARS MISSIONS

Meeting the challenge of manned lunar and Martian exploration
p 37 N95-11970

Integral habitat transport system
[NASA-CR-197156] p 38 N95-12629

MANUFACTURING

Body dimensions for apparel
[PB94-187739] p 37 N95-11908

MARS BASES

Integral habitat transport system
[NASA-CR-197156] p 38 N95-12629

MEDICAL PERSONNEL

Meeting the nation's needs for biomedical and behavioral scientists
[LC-94-66477] p 28 N95-12310

MEDICAL SERVICES

Meeting the nation's needs for biomedical and behavioral scientists
[LC-94-66477] p 28 N95-12310

MEMBRANES

Conformation of membrane proteins: Bacteriorhodopsin
[AD-A281282] p 30 N95-13373

MENTAL PERFORMANCE

Tank crew performance related to cognitive ability and motivation of the tank crew members
[PB94-190642] p 34 N95-11872

METABOLISM

Copper metabolism in rats fed ascorbic acid or restricted amounts of copper
[PB94-191343] p 28 N95-11902

Comparison of submaximal cycling and treadmill exercise at similar work rates
[AD-A283430] p 33 N95-12593

Regulation of alternative CO₂ fixation pathways in prokaryotic and eukaryotic photosynthetic organisms
[DE94-013180] p 30 N95-13271

METEOROLOGICAL PARAMETERS

Evaluation of candidate millimeter wave sensors for synthetic vision
p 39 N95-13214

MICROBIOLOGY

Morphological differentiation of colon carcinoma cell lines in rotating wall vessels
[NASA-CR-196780] p 31 N95-11808

MICROGRAVITY

Mammalian cell cultivation in space
p 27 A95-61564

Morphological differentiation of colon carcinoma cell lines in rotating wall vessels
[NASA-CR-196780] p 31 N95-11808

Effect of decreased gravity on circulation in the rat
[NASA-CR-196946] p 29 N95-12827

MICROORGANISMS

Competition in the chemostat: Global asymptotic behavior of a model with delayed response in growth
[BTN-94-EIX94341340323] p 27 A95-60859

Microbial communities in subsurface environments: Diversity, origin, and evolution
[DE94-013699] p 27 N95-11737

Regulation of alternative CO₂ fixation pathways in prokaryotic and eukaryotic photosynthetic organisms
[DE94-013180] p 30 N95-13271

MICROWAVE TRANSMISSION

Search for extraterrestrial intelligence/High Resolution Microwave Survey team member
[NASA-CR-196478] p 39 N95-13026

MICROWAVES

Radiotfrequency/microwave radiation biological effects and safety standards: A review
[AD-A282886] p 33 N95-12919

MILITARY TECHNOLOGY

Acute inhalation of explosively disseminated carbon fibers in rats
[AD-A280556] p 29 N95-12614

MILLIMETER WAVES

Evaluation of candidate millimeter wave sensors for synthetic vision
p 39 N95-13214

MINERAL DEPOSITS

On the isolation of halophilic microorganisms from salt deposits of great geological age
p 28 N95-11966

MISSION PLANNING

Meeting the challenge of manned lunar and Martian exploration
p 37 N95-11970

MODELS

Modelling of biopotential recordings and its implications for instrumentation design
[PB94-206844] p 30 N95-13408

MOLECULAR BIOLOGY

Microbial communities in subsurface environments: Diversity, origin, and evolution
[DE94-013699] p 27 N95-11737

Summary of the Sixteenth Annual Conference on Shock
[AD-A282643] p 32 N95-12542

Regulation of alternative CO₂ fixation pathways in prokaryotic and eukaryotic photosynthetic organisms
[DE94-013180] p 30 N95-13271

MONKEYS

Vestibular afferent responses to linear accelerations in the alert squirrel monkey
[NASA-TM-4581] p 28 N95-12006

Reduction of ocular counter-rolling by adaptation to space
[NASA-CR-196279] p 32 N95-12376

Spaceflight and immune responses of Rhesus monkeys
[NASA-CR-196846] p 29 N95-12941

MORPHOLOGY

Morphological differentiation of colon carcinoma cell lines in rotating wall vessels
[NASA-CR-196780] p 31 N95-11808

MOTION PERCEPTION

Visual psychophysics of egomotion
[AD-A282547] p 35 N95-12495

MOTIVATION

- Tank crew performance related to cognitive ability and motivation of the tank crew members
[PB94-190642] p 34 N95-11872

MULTISENSOR FUSION

- Evaluation of candidate millimeter wave sensors for synthetic vision p 39 N95-13214

MUSCLES

- A musculoskeletal model of the elbow joint complex [NASA-CR-195812] p 34 N95-13270

MUSCULAR FUNCTION

- Preconditioning electromyographic data for an upper extremity model using neural networks [NASA-CR-196877] p 31 N95-11708

MUSCULOSKELETAL SYSTEM

- A musculoskeletal model of the elbow joint complex [NASA-CR-195812] p 34 N95-13270

N**NEURAL NETS**

- Preconditioning electromyographic data for an upper extremity model using neural networks [NASA-CR-196877] p 31 N95-11708

- Neural networks: Structure and repair. Part 1: Ground squirrel visual system. Part 2: Formation, maintenance and plasticity of synaptic connections [AD-A282420] p 29 N95-12393

NEUROGLIA

- Neural networks: Structure and repair. Part 1: Ground squirrel visual system. Part 2: Formation, maintenance and plasticity of synaptic connections [AD-A282420] p 29 N95-12393

NEUROMUSCULAR TRANSMISSION

- Inhibition-produced patterning in chains of coupled nonlinear oscillators [BTN-94-EIX94341340325] p 27 A95-60861

NEURONS

- Neural networks: Structure and repair. Part 1: Ground squirrel visual system. Part 2: Formation, maintenance and plasticity of synaptic connections [AD-A282420] p 29 N95-12393

NEUROPHYSIOLOGY

- Preconditioning electromyographic data for an upper extremity model using neural networks [NASA-CR-196877] p 31 N95-11708

NEUTRAL BUOYANCY SIMULATION

- Evaluation of COSTAR mass handling characteristics in an environment. A simulation of the Hubble Space Telescope service mission [NASA-TP-3489] p 32 N95-11887

NIGHT VISION

- Visit to UDRI and USAF, Armstrong Lab., Williams AFB, Phoenix, USA, February 8-11, 1993 [PB94-190659] p 36 N95-11873

NOISE POLLUTION

- Effects of Noise on Hearing 5th International Symposium [AD-A281439] p 33 N95-13177

NONLINEARITY

- Inhibition-produced patterning in chains of coupled nonlinear oscillators [BTN-94-EIX94341340325] p 27 A95-60861

NUCLEAR REACTOR CONTROL

- Design issues of human operator support systems [PB94-191376] p 36 N95-11778

NUTRITION

- Competition in the chemostat: Global asymptotic behavior of a model with delayed response in growth [BTN-94-EIX94341340323] p 27 A95-60859

O**OCCULTATION**

- Acute inhalation of explosively disseminated carbon fibers in rats [AD-A280556] p 29 N95-12614

OPERATORS (PERSONNEL)

- Design issues of human operator support systems [PB94-191376] p 36 N95-11778

OPTICAL EQUIPMENT

- Evaluation of COSTAR mass handling characteristics in an environment. A simulation of the Hubble Space Telescope service mission [NASA-TP-3489] p 32 N95-11887

OPTICAL FIBERS

- Modelling of biopotential recordings and its implications for instrumentation design [PB94-206844] p 30 N95-13408

OPTICAL MEASUREMENT

- Visual psychophysics of egomotion [AD-A282547] p 35 N95-12495

ORBITAL SERVICING

- Evaluation of COSTAR mass handling characteristics in an environment. A simulation of the Hubble Space Telescope service mission [NASA-TP-3489] p 32 N95-11887

OSCILLATORS

- Inhibition-produced patterning in chains of coupled nonlinear oscillators [BTN-94-EIX94341340325] p 27 A95-60861

OTOLITH ORGANS

- Vestibular afferent responses to linear accelerations in the alert squirrel monkey [NASA-TM-4581] p 28 N95-12006

- Reduction of ocular counter-rolling by adaptation to space [NASA-CR-196279] p 32 N95-12376

OXYGEN

- Effects of oral glucose on exercise thermoregulation in men after water immersion [NASA-TM-108825] p 28 N95-11810

OZONE

- Consequences of prolonged inhalation of ozone on Fischer-344/N rats: Collaborative studies. Part 1: Content and cross-linking of lung collagen [PB94-182748] p 30 N95-13176

P**PALEOBIOLOGY**

- On the isolation of halophilic microorganisms from salt deposits of great geological age p 28 N95-11966

PATTERN RECOGNITION

- How are three-dimensional objects represented in the brain? [AD-A282367] p 34 N95-11942

PERFORMANCE TESTS

- Age 60 study. Part 4: Experimental evaluation of pilot performance [REPT-8025-4B] p 35 N95-13199

PERSONNEL

- Visit to UDRI and USAF, Armstrong Lab., Williams AFB, Phoenix, USA, February 8-11, 1993 [PB94-190659] p 36 N95-11873
- Meeting the nation's needs for biomedical and behavioral scientists [LC-94-66477] p 28 N95-12310

PERSONNEL SELECTION

- Tank crew performance related to cognitive ability and motivation of the tank crew members [PB94-190642] p 34 N95-11872

PHARMACOLOGY

- Copper metabolism in rats fed ascorbic acid or restricted amounts of copper [PB94-191343] p 28 N95-11902

PHASE TRANSFORMATIONS

- Particle method for population waves [BTN-94-EIX94341340324] p 27 A95-60860

PHOTOSYNTHESIS

- Regulation of alternative CO₂ fixation pathways in prokaryotic and eukaryotic photosynthetic organisms [DE94-013180] p 30 N95-13271

PHYSICAL EXERCISE

- Effects of oral glucose on exercise thermoregulation in men after water immersion [NASA-TM-108825] p 28 N95-11810

- Carbon dioxide and water vapor production at rest and during exercise. A report on data collection for the Crew and Thermal Systems Division [NASA-TP-3500] p 36 N95-11811

- Comparison of submaximal cycling and treadmill exercise at similar work rates [AD-A283430] p 33 N95-12593

PHYSIOLOGICAL EFFECTS

- Summary of the Sixteenth Annual Conference on Shock [AD-A282643] p 32 N95-12542

- Effect of decreased gravity on circulation in the rat [NASA-CR-196946] p 29 N95-12827

PHYSIOLOGICAL RESPONSES

- Vestibular afferent responses to linear accelerations in the alert squirrel monkey [NASA-TM-4581] p 28 N95-12006

- Comparison of submaximal cycling and treadmill exercise at similar work rates [AD-A283430] p 33 N95-12593

- Spaceflight and immune responses of Rhesus monkeys [NASA-CR-196846] p 29 N95-12941

PHYSIOLOGY

- Psychophysiological assessment methods (including a register of psychophysiologicalists on microfiches) [AGARD-AR-324] p 34 N95-12133

PILOT PERFORMANCE

- Crew factors in flight operations 9: Effects of planned cockpit rest on crew performance and alertness in long-haul operations [NASA-TM-108839] p 33 N95-12792

- Age 60 Rule research. Part 1: Bibliographic database [DOT/FAA/AM-94/20-PT-1] p 35 N95-13019

- Age 60 Rule. Part 2: Airline pilot age and performance. A review of the scientific literature [DOT/FAA/AM-94/21-PT-2] p 35 N95-13020

- Age 60 study. Part 4: Experimental evaluation of pilot performance [REPT-8025-4B] p 35 N95-13199

- Evaluation of candidate millimeter wave sensors for synthetic vision p 39 N95-13214

PLANTS (BOTANY)

- Techniques for optimal crop selection in a controlled ecological life support system p 37 N95-11962

POPULATION THEORY

- Particle method for population waves [BTN-94-EIX94341340324] p 27 A95-60860

PORTABLE LIFE SUPPORT SYSTEMS

- Interviews with the Apollo lunar surface astronauts in support of planning for EVA systems design [NASA-TM-108846] p 37 N95-11905

- Meeting the challenge of manned lunar and Martian exploration p 37 N95-11970

- The embodiment design of the heat rejection system for the portable life support system [NASA-CR-197178] p 38 N95-12555

POTABLE WATER

- Elimination of quinine in two subjects after ingestion of tonic water: An exploratory study [DOT/FAA/AM-94/16] p 31 N95-11702

POTATOES

- Growth of potatoes for CELSS [NASA-CR-177646] p 37 N95-11949

- Methodologies for processing plant material into acceptable food on a small scale [NASA-CR-177647] p 38 N95-12132

PREDICTIONS

- Meeting the nation's needs for biomedical and behavioral scientists [LC-94-66477] p 28 N95-12310

PRESSURE EFFECTS

- Ultrasort laser pulse effects in ocular and related media: Laser-induced shock wave propagation and retinal damage [AD-A282599] p 32 N95-12535

PROCESS CONTROL (INDUSTRY)

- Design issues of human operator support systems [PB94-191376] p 36 N95-11778

PROGRAMMING ENVIRONMENTS

- Design issues of human operator support systems [PB94-191376] p 36 N95-11778

PROJECT SETI

- Search for extraterrestrial intelligence/High Resolution Microwave Survey team member [NASA-CR-196478] p 39 N95-13026

PROKARYOTES

- Regulation of alternative CO₂ fixation pathways in prokaryotic and eukaryotic photosynthetic organisms [DE94-013180] p 30 N95-13271

PROTECTIVE CLOTHING

- Aerospace medicine and biology: A continuing bibliography with indexes (supplement 394) [NASA-SP-7011(394)] p 34 N95-13230

PROTEINS

- Rational enzyme redesign [DE94-014565] p 29 N95-12677

- Conformation of membrane proteins: Bacteriorhodopsin [AD-A281282] p 30 N95-13373

PSYCHOLOGICAL TESTS

- Age 60 Rule. Part 2: Airline pilot age and performance. A review of the scientific literature [DOT/FAA/AM-94/21-PT-2] p 35 N95-13020

PSYCHOPHYSICS

- How are three-dimensional objects represented in the brain? [AD-A282367] p 34 N95-11942

- Visual psychophysics of egomotion [AD-A282547] p 35 N95-12495

PSYCHOPHYSIOLOGY

- Psychophysiological assessment methods (including a register of psychophysiologicalists on microfiches) [AGARD-AR-324] p 34 N95-12133

PUBLIC HEALTH

- Meeting the nation's needs for biomedical and behavioral scientists [LC-94-66477] p 28 N95-12310

PULSED LASERS

- Ultrasort laser pulse effects in ocular and related media: Laser-induced shock wave propagation and retinal damage [AD-A282599] p 32 N95-12535

R

RADIATION EFFECTS

Radiofrequency/microwave radiation biological effects and safety standards: A review
[AD-A282886] p 33 N95-12919

RADIATIVE HEAT TRANSFER

The embodiment design of the heat rejection system for the portable life support system
[NASA-CR-197178] p 38 N95-12555

RADIO ASTRONOMY

Search for extraterrestrial intelligence/High Resolution Microwave Survey team member
[NASA-CR-196478] p 39 N95-13026

RADIO FREQUENCY INTERFERENCE

Search for extraterrestrial intelligence/High Resolution Microwave Survey team member
[NASA-CR-196478] p 39 N95-13026

RADIO WAVES

Radiofrequency/microwave radiation biological effects and safety standards: A review
[AD-A282886] p 33 N95-12919

RADIOIMMUNOASSAY

Spaceflight and immune responses of Rhesus monkeys
[NASA-CR-196846] p 29 N95-12941

RATINGS

Age 60 study. Part 4: Experimental evaluation of pilot performance
[REPT-8025-4B] p 35 N95-13199

RATS

Copper metabolism in rats fed ascorbic acid or restricted amounts of copper
[PB94-191343] p 28 N95-11902
Acute inhalation of explosively disseminated carbon fibers in rats
[AD-A280556] p 29 N95-12614
Effect of decreased gravity on circulation in the rat
[NASA-CR-196946] p 29 N95-12827
Consequences of prolonged inhalation of ozone on Fischer-344/N rats: Collaborative studies. Part 1: Content and cross-linking of lung collagen
[PB94-182748] p 30 N95-13176

REACTION KINETICS

Rational enzyme redesign
[DE94-014565] p 29 N95-12677

RECORDING INSTRUMENTS

Modelling of biopotential recordings and its implications for instrumentation design
[PB94-206844] p 30 N95-13408

REGULATIONS

Age 60 study. Part 4: Experimental evaluation of pilot performance
[REPT-8025-4B] p 35 N95-13199

REMOTE MANIPULATOR SYSTEM

Evaluation of COSTAR mass handling characteristics in an environment. A simulation of the Hubble Space Telescope service mission
[NASA-TP-3489] p 32 N95-11887

RESEARCH AND DEVELOPMENT

JPRS report: Science and technology. Central Eurasia: Life sciences
[JPRS-ULS-93-012] p 31 N95-11744

RESPIRATION

A numerical analysis of the distribution of stresses in lung parenchyma which accounts for the interactions between the tissue skeleton and flowing air
p 31 N95-11806

Acute inhalation of explosively disseminated carbon fibers in rats
[AD-A280556] p 29 N95-12614
Consequences of prolonged inhalation of ozone on Fischer-344/N rats: Collaborative studies. Part 1: Content and cross-linking of lung collagen
[PB94-182748] p 30 N95-13176

RESPIRATORY PHYSIOLOGY

A numerical analysis of the distribution of stresses in lung parenchyma which accounts for the interactions between the tissue skeleton and flowing air
p 31 N95-11806

RETINA

Neural networks: Structure and repair. Part 1: Ground squirrel visual system. Part 2: Formation, maintenance and plasticity of synaptic connections
[AD-A282420] p 29 N95-12393

Ultrashort laser pulse effects in ocular and related media: Laser-induced shock wave propagation and retinal damage
[AD-A282599] p 32 N95-12535

RETIREMENT

Age 60 Rule research. Part 1: Bibliographic database
[DOT/FAA/AM-94/20-PT-1] p 35 N95-13019
Age 60 Rule. Part 2: Airline pilot age and performance. A review of the scientific literature
[DOT/FAA/AM-94/21-PT-2] p 35 N95-13020

ROVING VEHICLES

Integral habitat transport system
[NASA-CR-197156] p 38 N95-12629

RUSSIAN FEDERATION

JPRS report: Science and technology. Central Eurasia: Life sciences
[JPRS-ULS-93-012] p 31 N95-11744

S

SAFETY MANAGEMENT

Radiofrequency/microwave radiation biological effects and safety standards: A review
[AD-A282886] p 33 N95-12919

SALTS

On the isolation of halophilic microorganisms from salt deposits of great geological age
p 28 N95-11966

SCENE ANALYSIS

Scene analysis: A brief survey
[PB94-205085] p 36 N95-13433

SENSORIMOTOR PERFORMANCE

Coordinated action in 3-D space
[AD-A281284] p 35 N95-13375

SEQUENCING

Microbial communities in subsurface environments: Diversity, origin, and evolution
[DE94-013699] p 27 N95-11737

SHOCK (PHYSIOLOGY)

Summary of the Sixteenth Annual Conference on Shock
[AD-A282643] p 32 N95-12542

SHOCK WAVES

Ultrashort laser pulse effects in ocular and related media: Laser-induced shock wave propagation and retinal damage
[AD-A282599] p 32 N95-12535

SINE WAVES

Dynamic sine wave response measurements of CRT displays using sinusoidal counterphase modulation
[AD-A282222] p 32 N95-12406

SIZE DETERMINATION

Body dimensions for apparel
[PB94-187739] p 37 N95-11908

SKY SURVEYS (ASTRONOMY)

Search for extraterrestrial intelligence/High Resolution Microwave Survey team member
[NASA-CR-196478] p 39 N95-13026

SLEEP

Crew factors in flight operations 9: Effects of planned cockpit rest on crew performance and alertness in long-haul operations
[NASA-TM-108839] p 33 N95-12792

SMOKE

Simultaneous gas-chromatographic determination of four toxic gases generally present in combustion atmospheres
[DOT/FAA/AM-94/18] p 38 N95-12354

SOUND PRESSURE

Effects of Noise on Hearing 5th International Symposium
[AD-A281439] p 33 N95-13177

SOYBEANS

Methodologies for processing plant material into acceptable food on a small scale
[NASA-CR-177647] p 38 N95-12132

SPACE EXPLORATION

Interviews with the Apollo lunar surface astronauts in support of planning for EVA systems design
[NASA-TM-108846] p 37 N95-11905

SPACE FLIGHT STRESS

Effect of decreased gravity on circulation in the rat
[NASA-CR-196946] p 29 N95-12827
Spaceflight and immune responses of Rhesus monkeys
[NASA-CR-196846] p 29 N95-12941

SPACE HABITATS

Integral habitat transport system
[NASA-CR-197156] p 38 N95-12629

SPACE MISSIONS

Evaluation of COSTAR mass handling characteristics in an environment. A simulation of the Hubble Space Telescope service mission
[NASA-TP-3489] p 32 N95-11887

SPACE PERCEPTION

How are three-dimensional objects represented in the brain?
[AD-A282367] p 34 N95-11942

SPACE SHUTTLE PAYLOADS

Human factors assessments of the STS-57 SpaceHab-1 mission
[NASA-TM-104802] p 36 N95-11878

SPACE STATION PAYLOADS

Life Sciences Centrifuge Facility assessment
[NASA-CR-196848] p 30 N95-13423

SPACE STATIONS

Life Sciences Centrifuge Facility assessment
[NASA-CR-196848] p 30 N95-13423

SPACE SUITS

Interviews with the Apollo lunar surface astronauts in support of planning for EVA systems design
[NASA-TM-108846] p 37 N95-11905
Meeting the challenge of manned lunar and Martian exploration
p 37 N95-11970

SPACE TRANSPORTATION SYSTEM FLIGHTS

Evaluation of COSTAR mass handling characteristics in an environment. A simulation of the Hubble Space Telescope service mission
[NASA-TP-3489] p 32 N95-11887

SPACEBORNE ASTRONOMY

Search for extraterrestrial intelligence/High Resolution Microwave Survey team member
[NASA-CR-196478] p 39 N95-13026

SPACEBORNE EXPERIMENTS

Training for life science experiments in space at the NASA Ames Research Center
p 37 N95-11964

SPACECRAFT CABIN ATMOSPHERES

Carbon dioxide and water vapor production at rest and during exercise. A report on data collection for the Crew and Thermal Systems Division
[NASA-TP-3500] p 36 N95-11811

SPACECRAFT ENVIRONMENTS

Human factors assessments of the STS-57 SpaceHab-1 mission
[NASA-TM-104802] p 36 N95-11878

SPACECRAFT RADIATORS

The embodiment design of the heat rejection system for the portable life support system
[NASA-CR-197178] p 38 N95-12555

SPACELAB PAYLOADS

Training for life science experiments in space at the NASA Ames Research Center
p 37 N95-11964

STANDARDIZATION

Standards relevant to a NATO anthropometry survey using 3D imaging tools
[AD-A283065] p 39 N95-13055

STRESS ANALYSIS

A numerical analysis of the distribution of stresses in lung parenchyma which accounts for the interactions between the tissue skeleton and flowing air
p 31 N95-11806

STRUCTURAL DESIGN

M.E.366-J embodiment design project: Portable foot restraint
[NASA-CR-197163] p 38 N95-12361

SUBSTRATES

Rational enzyme redesign
[DE94-014565] p 29 N95-12677

SUPPORT SYSTEMS

Design issues of human operator support systems
[PB94-191376] p 36 N95-11778
Meeting the challenge of manned lunar and Martian exploration
p 37 N95-11970

SYNAPSES

Neural networks: Structure and repair. Part 1: Ground squirrel visual system. Part 2: Formation, maintenance and plasticity of synaptic connections
[AD-A282420] p 29 N95-12393

SYNCHRONISM

Particle method for population waves
[BTN-94-EIX94341340324] p 27 N95-60860

SYSTEMS ENGINEERING

Meeting the challenge of manned lunar and Martian exploration
p 37 N95-11970

T

TANKS (COMBAT VEHICLES)

Tank crew performance related to cognitive ability and motivation of the tank crew members
[PB94-190642] p 34 N95-11872

TASK COMPLEXITY

Age 60 study. Part 4: Experimental evaluation of pilot performance
[REPT-8025-4B] p 35 N95-13199

TECHNOLOGIES

JPRS report: Science and technology. Central Eurasia: Life sciences
[JPRS-ULS-93-012] p 31 N95-11744

TEMPERATURE CONTROL

The embodiment design of the heat rejection system for the portable life support system
[NASA-CR-197178] p 38 N95-12555

TENSILE STRENGTH

Acute inhalation of explosively disseminated carbon fibers in rats
[AD-A280556] p 29 N95-12614

TEST FACILITIES

Evaluation of COSTAR mass handling characteristics in an environment. A simulation of the Hubble Space Telescope service mission
[NASA-TP-3489] p 32 N95-11887

THERAPY

Summary of the Sixteenth Annual Conference on Shock
[AD-A282643] p 32 N95-12542

THERMOREGULATION

Effects of oral glucose on exercise thermoregulation in men after water immersion
[NASA-TM-108825] p 28 N95-11810

THRESHOLDS (PERCEPTION)

Effects of Noise on Hearing 5th International Symposium
[AD-A281439] p 33 N95-13177

TIME LAG

Competition in the chemostat: Global asymptotic behavior of a model with delayed response in growth
[BTN-94-EIX94341340323] p 27 A95-60859

TOLERANCES (PHYSIOLOGY)

Effects of Noise on Hearing 5th International Symposium
[AD-A281439] p 33 N95-13177

TOWERS

Evaluation of candidate millimeter wave sensors for synthetic vision p 39 N95-13214

TOXICITY

Simultaneous gas-chromatographic determination of four toxic gases generally present in combustion atmospheres
[DOT/FAA/AM-94/18] p 38 N95-12354

TOXINS AND ANTITOXINS

Neural networks: Structure and repair. Part 1: Ground squirrel visual system. Part 2: Formation, maintenance and plasticity of synaptic connections
[AD-A282420] p 29 N95-12393

TRAINING SIMULATORS

Visit to UDRI and USAF, Armstrong Lab., Williams AFB, Phoenix, USA, February 8-11, 1993
[PB94-190659] p 36 N95-11873

TRANSDUCERS

Modelling of biopotential recordings and its implications for instrumentation design
[PB94-206844] p 30 N95-13408

TRANSMITTERS

Search for extraterrestrial intelligence/High Resolution Microwave Survey team member
[NASA-CR-196478] p 39 N95-13026

TRAVELING WAVES

Inhibition-produced patterning in chains of coupled nonlinear oscillators
[BTN-94-EIX94341340325] p 27 A95-60861

TREADMILLS

Comparison of submaximal cycling and treadmill exercise at similar work rates
[AD-A283430] p 33 N95-12593

V**VERTEBRATES**

Inhibition-produced patterning in chains of coupled nonlinear oscillators
[BTN-94-EIX94341340325] p 27 A95-60861

VESTIBULAR NYSTAGMUS

Reduction of ocular counter-rolling by adaptation to space
[NASA-CR-196279] p 32 N95-12376

VESTIBULAR TESTS

Reduction of ocular counter-rolling by adaptation to space
[NASA-CR-196279] p 32 N95-12376

VISCOUS DAMPING

Evaluation of COSTAR mass handling characteristics in an environment. A simulation of the Hubble Space Telescope service mission
[NASA-TP-3489] p 32 N95-11887

VISUAL ACUITY

Neural networks: Structure and repair. Part 1: Ground squirrel visual system. Part 2: Formation, maintenance and plasticity of synaptic connections
[AD-A282420] p 29 N95-12393

VISUAL PERCEPTION

Visit to UDRI and USAF, Armstrong Lab., Williams AFB, Phoenix, USA, February 8-11, 1993
[PB94-190659] p 36 N95-11873
Visual psychophysics of egomotion
[AD-A282547] p 35 N95-12495

VISUAL PIGMENTS

Conformation of membrane proteins: Bacteriorhodopsin
[AD-A281282] p 30 N95-13373

VISUAL SIGNALS

Evaluation of candidate millimeter wave sensors for synthetic vision p 39 N95-13214

VITAMINS

Copper metabolism in rats fed ascorbic acid or restricted amounts of copper
[PB94-191343] p 28 N95-11902

W**WALKING MACHINES**

Integral habitat transport system
[NASA-CR-197156] p 38 N95-12629

WATER

Evaluation of COSTAR mass handling characteristics in an environment. A simulation of the Hubble Space Telescope service mission
[NASA-TP-3489] p 32 N95-11887

WATER CONSUMPTION

Elimination of quinine in two subjects after ingestion of tonic water: An exploratory study
[DOT/FAA/AM-94/16] p 31 N95-11702

WATER IMMERSION

Effects of oral glucose on exercise thermoregulation in men after water immersion
[NASA-TM-108825] p 28 N95-11810

WATER VAPOR

Carbon dioxide and water vapor production at rest and during exercise. A report on data collection for the Crew and Thermal Systems Division
[NASA-TP-3500] p 36 N95-11811

WEIGHTLESSNESS

Spaceflight and immune responses of Rhesus monkeys
[NASA-CR-196846] p 29 N95-12941

WEIGHTLESSNESS SIMULATION

Evaluation of COSTAR mass handling characteristics in an environment. A simulation of the Hubble Space Telescope service mission
[NASA-TP-3489] p 32 N95-11887

WHEAT

Methodologies for processing plant material into acceptable food on a small scale
[NASA-CR-177647] p 38 N95-12132

WORKLOADS (PSYCHOPHYSIOLOGY)

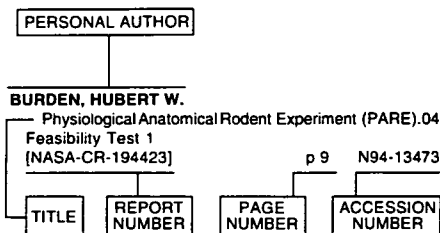
Crew factors in flight operations 9: Effects of planned cockpit rest on crew performance and alertness in long-haul operations
[NASA-TM-108839] p 33 N95-12792

PERSONAL AUTHOR INDEX

AEROSPACE MEDICINE AND BIOLOGY / A Continuing Bibliography (Supplement 398)

February 1995

Typical Personal Author Index Listing



Listings in this index are arranged alphabetically by personal author. The title of the document is used to provide a brief description of the subject matter. The report number helps to indicate the type of document (e.g., NASA report, translation, NASA contractor report). The page and accession numbers are located beneath and to the right of the title. Under any one author's name the accession numbers are arranged in sequence.

A

- ABRAHAM, LAWRENCE D.**
A musculoskeletal model of the elbow joint complex
[NASA-CR-195812] p 34 N95-13270
- ADAM, SUE**
Human factors assessments of the STS-57 SpaceHab-1 mission
[NASA-TM-104802] p 36 N95-11878
- ALEXANDER, NEAL T.**
Evaluation of candidate millimeter wave sensors for synthetic vision p 39 N95-13214

B

- BARNES, PAUL R.**
Effects of oral glucose on exercise thermoregulation in men after water immersion
[NASA-TM-108825] p 28 N95-11810
- BARR, R. E.**
Preconditioning electromyographic data for an upper extremity model using neural networks
[NASA-CR-196877] p 31 N95-11708
- BARR, RONALD E.**
A musculoskeletal model of the elbow joint complex
[NASA-CR-195812] p 34 N95-13270
- BEASLEY, HOWARD H.**
Dynamic sine wave response measurements of CRT displays using sinusoidal counterphase modulation
[AD-A282222] p 32 N95-12406
- BENSON, ROBERT H.**
Life Sciences Centrifuge Facility assessment
[NASA-CR-196848] p 30 N95-13423
- BERGMANN, JEFFREY D.**
Acute inhalation of explosively disseminated carbon fibers in rats
[AD-A280556] p 29 N95-12614
- BINDON, JOHN N.**
Methodologies for processing plant material into acceptable food on a small scale
[NASA-CR-177647] p 38 N95-12132
- BLANCO, ROSA E.**
Neural networks: Structure and repair. Part 1: Ground squirrel visual system. Part 2: Formation, maintenance and plasticity of synaptic connections
[AD-A282420] p 29 N95-12393

- BOLEN, SCOTT M.**
Radiofrequency/microwave radiation biological effects and safety standards: A review
[AD-A282886] p 33 N95-12919
- BOWLES, ANTHONY J. G.**
Methodologies for processing plant material into acceptable food on a small scale
[NASA-CR-177647] p 38 N95-12132
- BRECKLER, JENNIFER L.**
Effects of oral glucose on exercise thermoregulation in men after water immersion
[NASA-TM-108825] p 28 N95-11810
- BRUCKART, JAMES E.**
Biomedical imaging
[AD-A282221] p 32 N95-12405
- Standards relevant to a NATO anthropometry survey using 3D imaging tools
[AD-A283065] p 39 N95-13055
- BUELTHOFF, HEINRICH H.**
How are three-dimensional objects represented in the brain?
[AD-A282367] p 34 N95-11942
- BURNETT, DAVID C.**
Acute inhalation of explosively disseminated carbon fibers in rats
[AD-A280556] p 29 N95-12614

C

- CALDWELL, JOHN A.**
Psychophysiological assessment methods (including a register of psychophysiologicals on microfiches)
[AGARD-AR-324] p 34 N95-12133
- CANFIELD, DENNIS V.**
Elimination of quinine in two subjects after ingestion of tonic water: An exploratory study
[DOT/FAA/AM-94/16] p 31 N95-11702
- CAO, W.**
Growth of potatoes for CELSS
[NASA-CR-177646] p 37 N95-11949
- CARETTI, DAVID M.**
Comparison of submaximal cycling and treadmill exercise at similar work rates
[AD-A283430] p 33 N95-12593
- CARRION, CARLOS A.**
The embodiment design of the heat rejection system for the portable life support system
[NASA-CR-197178] p 38 N95-12555
- CETINGUC, MUZAFFER**
Psychophysiological assessment methods (including a register of psychophysiologicals on microfiches)
[AGARD-AR-324] p 34 N95-12133
- CHATURVEDI, ARVIND K.**
Simultaneous gas-chromatographic determination of four toxic gases generally present in combustion atmospheres
[DOT/FAA/AM-94/18] p 38 N95-12354
- CHIU, CHICHIA**
Particle method for population waves
[BTN-94-EIX94341340324] p 27 A95-60860
- COHEN, BERNARD**
Reduction of ocular counter-rolling by adaptation to space
[NASA-CR-196279] p 32 N95-12376
- CONNELL, LINDA J.**
Crew factors in flight operations 9: Effects of planned cockpit rest on crew performance and alertness in long-haul operations
[NASA-TM-108839] p 33 N95-12792
- CONNORS, MARY M.**
Interviews with the Apollo lunar surface astronauts in support of planning for EVA systems design
[NASA-TM-108846] p 37 N95-11905

D

- DAI, MINGJIA**
Reduction of ocular counter-rolling by adaptation to space
[NASA-CR-196279] p 32 N95-12376

- DEARBORN, ALAN S.**
Effects of oral glucose on exercise thermoregulation in men after water immersion
[NASA-TM-108825] p 28 N95-11810
- DEIMLER, J. D.**
Age 60 Rule. Part 2: Airline pilot age and performance. A review of the scientific literature
[DOT/FAA/AM-94/21-PT-2] p 35 N95-13020
- Age 60 study. Part 4: Experimental evaluation of pilot performance
[REPT-8025-4B] p 35 N95-13199
- DENNER, EWALD**
On the isolation of halophilic microorganisms from salt deposits of great geological age p 28 N95-11966
- DEREFELDT, G.**
Visit to UDRI and USAF, Armstrong Lab., Williams AFB, Phoenix, USA, February 8-11, 1993
[PB94-190659] p 36 N95-11873
- DEUTSCH, T. F.**
Ultrashort laser pulse effects in ocular and related media: Laser-induced shock wave propagation and retinal damage
[AD-A282599] p 32 N95-12535
- DINGES, DAVID F.**
Crew factors in flight operations 9: Effects of planned cockpit rest on crew performance and alertness in long-haul operations
[NASA-TM-108839] p 33 N95-12792
- DOREY, K.**
Ultrashort laser pulse effects in ocular and related media: Laser-induced shock wave propagation and retinal damage
[AD-A282599] p 32 N95-12535
- DOUKAS, A. G.**
Ultrashort laser pulse effects in ocular and related media: Laser-induced shock wave propagation and retinal damage
[AD-A282599] p 32 N95-12535
- DUNSKY, BETSY**
Techniques for optimal crop selection in a controlled ecological life support system p 37 N95-11962

E

- ECHARD, JIM D.**
Evaluation of candidate millimeter wave sensors for synthetic vision p 39 N95-13214
- EDELMAN, SHIMON Y.**
How are three-dimensional objects represented in the brain?
[AD-A282367] p 34 N95-11942
- ELLERMEYER, S. F.**
Competition in the chemostat: Global asymptotic behavior of a model with delayed response in growth
[BTN-94-EIX94341340323] p 27 A95-60859
- ELLIOTT, BILL**
Integral habitat transport system
[NASA-CR-197156] p 38 N95-12629
- ENDECOTT, BOYD R.**
Simultaneous gas-chromatographic determination of four toxic gases generally present in combustion atmospheres
[DOT/FAA/AM-94/18] p 38 N95-12354
- ENDERS, KEVIN**
M.E.366-J embodiment design project: Portable foot restraint
[NASA-CR-197163] p 38 N95-12361
- ENGDAHL, U.**
Visit to UDRI and USAF, Armstrong Lab., Williams AFB, Phoenix, USA, February 8-11, 1993
[PB94-190659] p 36 N95-11873
- EPPLER, DEAN B.**
Interviews with the Apollo lunar surface astronauts in support of planning for EVA systems design
[NASA-TM-108846] p 37 N95-11905
- ERMENTROUT, G. B.**
Inhibition-produced patterning in chains of coupled nonlinear oscillators
[BTN-94-EIX94341340325] p 27 A95-60861

L

ERTL, ANDREW C.

Effects of oral glucose on exercise thermoregulation in men after water immersion
[NASA-TM-108825] p 28 N95-11810

F

FASMAN, GERALD D.

Conformation of membrane proteins: Bacteriorhodopsin
[AD-A281282] p 30 N95-13373

FENG, MEIFU

Mammalian cell cultivation in space p 27 A95-61564

FERNJALLAH, M.

Preconditioning electromyographic data for an upper extremity model using neural networks
[NASA-CR-196877] p 31 N95-11708

FINN, CORY

Techniques for optimal crop selection in a controlled ecological life support system p 37 N95-11962

FLETCHER, LAUREN

Evaluation of COSTAR mass handling characteristics in an environment. A simulation of the Hubble Space Telescope service mission
[NASA-TP-3489] p 32 N95-11887

FLOTTE, T.

Ultrasound laser pulse effects in ocular and related media: Laser-induced shock wave propagation and retinal damage
[AD-A282599] p 32 N95-12535

FRANCOIS, JASON

The embodiment design of the heat rejection system for the portable life support system
[NASA-CR-197178] p 38 N95-12555

FRAZER, SCOTT

Integral habitat transport system
[NASA-CR-197156] p 38 N95-12629

G

GAILLARD, ANTHONY W. K.

Psychophysiological assessment methods (including a register of psychophysiologicalists on microfiches)
[AGARD-AR-324] p 34 N95-12133

GELZLEICHTER, T. R.

Consequences of prolonged inhalation of ozone on Fischer-344/N rats: Collaborative studies. Part 1: Content and cross-linking of lung collagen
[PB94-182748] p 30 N95-13176

GILLEN, KELLY A.

Crew factors in flight operations 9: Effects of planned cockpit rest on crew performance and alertness in long-haul operations
[NASA-TM-108839] p 33 N95-12792

GOLBITZ, PETER

Methodologies for processing plant material into acceptable food on a small scale
[NASA-CR-177647] p 38 N95-12132

GONZALEZ, R. V.

Preconditioning electromyographic data for an upper extremity model using neural networks
[NASA-CR-196877] p 31 N95-11708

GONZALEZ, ROGER V.

A musculoskeletal model of the elbow joint complex
[NASA-CR-195812] p 34 N95-13270

GRAEBER, R. CURTIS

Crew factors in flight operations 9: Effects of planned cockpit rest on crew performance and alertness in long-haul operations
[NASA-TM-108839] p 33 N95-12792

GREENLEAF, JOHN E.

Effects of oral glucose on exercise thermoregulation in men after water immersion
[NASA-TM-108825] p 28 N95-11810

GUNDER, ALEXANDER

Psychophysiological assessment methods (including a register of psychophysiologicalists on microfiches)
[AGARD-AR-324] p 34 N95-12133

GURMAN, E. B.

Age 60 Rule. Part 2: Airline pilot age and performance. A review of the scientific literature
[DOT/FAA/AM-94/21-PT-2] p 35 N95-13020

H

HARKEMA, J.

Consequences of prolonged inhalation of ozone on Fischer-344/N rats: Collaborative studies. Part 1: Content and cross-linking of lung collagen
[PB94-182748] p 30 N95-13176

HAWK, S.

Consequences of prolonged inhalation of ozone on Fischer-344/N rats: Collaborative studies. Part 1: Content and cross-linking of lung collagen
[PB94-182748] p 30 N95-13176

HEATON, RANDALL

M.E.366-J embodiment design project: Portable foot restraint
[NASA-CR-197163] p 38 N95-12361

HIGGS, JOEY

Integral habitat transport system
[NASA-CR-197156] p 38 N95-12629

HILASKI, ROGER J.

Acute inhalation of explosively disseminated carbon fibers in rats
[AD-A280556] p 29 N95-12614

HOLDEN, TINA

Human factors assessments of the STS-57 SpaceHab-1 mission
[NASA-TM-104802] p 36 N95-11878

HOPPENSTEADT, FRANK C.

Particle method for population waves
[BTN-94-EIX94341340324] p 27 A95-60860

HORDINSKY, JERRY R.

Elimination of quinine in two subjects after ingestion of tonic water: An exploratory study
[DOT/FAA/AM-94/16] p 31 N95-11702

HUDSON, BRIAN H.

Evaluation of candidate millimeter wave sensors for synthetic vision p 39 N95-13214

HUFF, JASON

Integral habitat transport system
[NASA-CR-197156] p 38 N95-12629

HYLAND, D. T.

Age 60 Rule. Part 2: Airline pilot age and performance. A review of the scientific literature
[DOT/FAA/AM-94/21-PT-2] p 35 N95-13020
Age 60 study. Part 4: Experimental evaluation of pilot performance
[REPT-8025-4B] p 35 N95-13199

J

JACKSON, CATHERINE G. R.

Effects of oral glucose on exercise thermoregulation in men after water immersion
[NASA-TM-108825] p 28 N95-11810

JESSUP, J. M.

Morphological differentiation of colon carcinoma cell lines in rotating wall vessels
[NASA-CR-196780] p 31 N95-11808

K

KAY, E. J.

Age 60 Rule. Part 2: Airline pilot age and performance. A review of the scientific literature
[DOT/FAA/AM-94/21-PT-2] p 35 N95-13020
Age 60 study. Part 4: Experimental evaluation of pilot performance
[REPT-8025-4B] p 35 N95-13199

KLUTE, GLENN K.

Evaluation of COSTAR mass handling characteristics in an environment. A simulation of the Hubble Space Telescope service mission
[NASA-TP-3489] p 32 N95-11887

KLYMENKO, VICTOR

Dynamic sine wave response measurements of CRT displays using sinusoidal counterphase modulation
[AD-A282222] p 32 N95-12406

KOPPELL, N.

Inhibition-produced patterning in chains of coupled nonlinear oscillators
[BTN-94-EIX94341340325] p 27 A95-60861

KOROS, ANTON, SR.

Human factors assessments of the STS-57 SpaceHab-1 mission
[NASA-TM-104802] p 36 N95-11878

KOWALCZYK, PIOTR

A numerical analysis of the distribution of stresses in lung parenchyma which accounts for the interactions between the tissue skeleton and flowing air p 31 N95-11806

KOZLOVSKAYA, INESSA

Reduction of ocular counter-rolling by adaptation to space
[NASA-CR-196279] p 32 N95-12376

KUFFLER, DAMIEN P.

Neural networks: Structure and repair. Part 1: Ground squirrel visual system. Part 2: Formation, maintenance and plasticity of synaptic connections
[AD-A282420] p 29 N95-12393

W

MUSE, WILLIAM T., JR.

Acute inhalation of explosively disseminated carbon fibers in rats
[AD-A280556] p 29 N95-12614

MYHRE, GRETE

Psychophysiological assessment methods (including a register of psychophysiologicals on microfiches)
[AGARD-AR-324] p 34 N95-12133

N

NIERZWIICKI-BAUER, S. A.

Microbial communities in subsurface environments: Diversity, origin, and evolution
[DE94-013699] p 27 N95-11737

O

ONEAL, MICHAEL

Human factors assessments of the STS-57 SpaceHab-1 mission
[NASA-TM-104802] p 36 N95-11878

ORNSTEIN, R. L.

Rational enzyme redesign
[DE94-014565] p 29 N95-12677

P

PARKS, THOMAS R.

Methodologies for processing plant material into acceptable food on a small scale
[NASA-CR-177647] p 38 N95-12132

PENG, JIANXIA

Mammalian cell cultivation in space
p 27 A95-61564

PHILLIPS, LEE

The embodiment design of the heat rejection system for the portable life support system
[NASA-CR-197178] p 38 N95-12555

POPOVIC, VOJIN P.

Effect of decreased gravity on circulation in the rat
[NASA-CR-196946] p 29 N95-12827

R

RAJULU, SUDHAKAR L.

Evaluation of COSTAR mass handling characteristics in an environment. A simulation of the Hubble Space Telescope service mission
[NASA-TP-3489] p 32 N95-11887

RAPHAN, THEODORE

Reduction of ocular counter-rolling by adaptation to space
[NASA-CR-196279] p 32 N95-12376

ROBERSON, D. J.

Preconditioning electromyographic data for an upper extremity model using neural networks
[NASA-CR-196877] p 31 N95-11708

ROBERTSON, C.

Scene analysis: A brief survey
[PB94-205085] p 36 N95-13433

RODRIGUES, ANNETTE T.

Training for life science experiments in space at the NASA Ames Research Center
p 37 N95-11964

ROSEKIND, MARK R.

Crew factors in flight operations 9: Effects of planned cockpit rest on crew performance and alertness in long-haul operations
[NASA-TM-108839] p 33 N95-12792

ROUNTREE, MICHAEL S.

Crew factors in flight operations 9: Effects of planned cockpit rest on crew performance and alertness in long-haul operations
[NASA-TM-108839] p 33 N95-12792

S

SANDERS, DONALD C.

Simultaneous gas-chromatographic determination of four toxic gases generally present in combustion atmospheres
[DOT/FAA/AM-94/18] p 38 N95-12354

SASSEN, A. M.

Design issues of human operator support systems
[PB94-191376] p 36 N95-11778

SCHMIDT, DAVEY

M.E.366-J embodiment design project: Portable foot restraint
[NASA-CR-197163] p 38 N95-12361

SCHOR, ROBERT H.

Vestibular afferent responses to linear accelerations in the alert squirrel monkey
[NASA-TM-4581] p 28 N95-12006

SHANNON, S. G.

Aviation epidemiology data register: Cardiovascular disease screening outcomes in the North Dakota Army National Guard aviator cohort
[AD-A283064] p 33 N95-13054

SICONOLFI, STEVEN F.

Carbon dioxide and water vapor production at rest and during exercise. A report on data collection for the Crew and Thermal Systems Division
[NASA-TP-3500] p 36 N95-11811

SIROTA, MISCHA

Reduction of ocular counter-rolling by adaptation to space
[NASA-CR-196279] p 32 N95-12376

SOMPS, CHRISTOPHER J.

Vestibular afferent responses to linear accelerations in the alert squirrel monkey
[NASA-TM-4581] p 28 N95-12006

SONG, CHANGCHENG

Mammalian cell cultivation in space
p 27 A95-61564

SONNENFELD, GERALD

Spacelighting and immune responses of Rhesus monkeys
[NASA-CR-196846] p 29 N95-12941

SPINWEBER, CHERYL L.

Crew factors in flight operations 9: Effects of planned cockpit rest on crew performance and alertness in long-haul operations
[NASA-TM-108839] p 33 N95-12792

STAN-LOTTER, HELGA

On the isolation of halophilic microorganisms from salt deposits of great geological age
p 28 N95-11966

STEFFES, PAUL G.

Search for extraterrestrial intelligence/High Resolution Microwave Survey team member
[NASA-CR-196478] p 39 N95-13026

STEINMAN, ROBERT M.

Coordinated action in 3-D space
[AD-A281284] p 35 N95-13375

STUCKWISCH, SUE

The embodiment design of the heat rejection system for the portable life support system
[NASA-CR-197178] p 38 N95-12555

T

TABITA, R.

Regulation of alternative CO₂ fixation pathways in prokaryotic and eukaryotic photosynthetic organisms
[DE94-013180] p 30 N95-13271

TARR, MICHAEL J.

How are three-dimensional objects represented in the brain?
[AD-A282367] p 34 N95-11942

THOMSON, SANDRA A.

Acute inhalation of explosively disseminated carbon fibers in rats
[AD-A280556] p 29 N95-12614

TIBBITTS, T. W.

Growth of potatoes for CELSS
[NASA-CR-177646] p 37 N95-11949

TOMKO, DAVID L.

Vestibular afferent responses to linear accelerations in the alert squirrel monkey
[NASA-TM-4581] p 28 N95-12006

TOOLE, JENNIFER

Human factors assessments of the STS-57 SpaceHab-1 mission
[NASA-TM-104802] p 36 N95-11878

TURANO, KATHLEEN

Visual psychophysics of egomotion
[AD-A282547] p 35 N95-12495

V

VANDENBERG, G. J.

Copper metabolism in rats fed ascorbic acid or restricted amounts of copper
[PB94-191343] p 28 N95-11902

VANRIJN, A. C. M.

Modelling of biopotential recordings and its implications for instrumentation design
[PB94-206844] p 30 N95-13408

VERONA, ROBERT W.

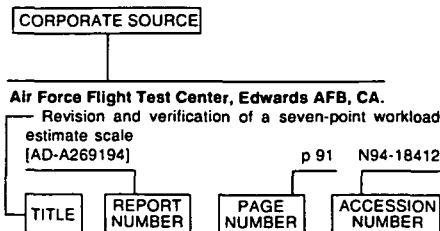
Dynamic sine wave response measurements of CRT displays using sinusoidal counterphase modulation
[AD-A282222] p 32 N95-12406

CORPORATE SOURCE INDEX

AEROSPACE MEDICINE AND BIOLOGY / A Continuing Bibliography (Supplement 398)

February 1995

Typical Corporate Source Index Listing



Listings in this index are arranged alphabetically by corporate source. The title of the document is used to provide a brief description of the subject matter. The page number and the accession number are included in each entry to assist the user in locating the abstract in the abstract section. If applicable, a report number is also included as an aid in identifying the document.

A

- Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).**
Psychophysiological assessment methods (including a register of psychophysiologicals on microfilm)
[AGARD-AR-324] p 34 N95-12133
- Army Aeromedical Research Lab., Fort Rucker, AL.**
Biomedical imaging
[AD-A282221] p 32 N95-12405
Dynamic sine wave response measurements of CRT displays using sinusoidal counterphase modulation
[AD-A282222] p 32 N95-12406
Aviation epidemiology data register: Cardiovascular disease screening outcomes in the North Dakota Army National Guard aviator cohort
[AD-A283064] p 33 N95-13054
Standards relevant to a NATO anthropometry survey using 3D imaging tools
[AD-A283065] p 39 N95-13055

B

- Benson (Robert H.), Springfield, VA.**
Life Sciences Centrifuge Facility assessment
[NASA-CR-196848] p 30 N95-13423
- Brandeis Univ., Waltham, MA.**
Conformation of membrane proteins: Bacteriorhodopsin
[AD-A281282] p 30 N95-13373

C

- California Univ., Davis, CA.**
Consequences of prolonged inhalation of ozone on Fischer-344/N rats: Collaborative studies. Part 1: Content and cross-linking of lung collagen
[PB94-182748] p 30 N95-13176

- Civil Aeromedical Inst., Oklahoma City, OK.**
Elimination of quinine in two subjects after ingestion of tonic water: An exploratory study
[DOT/FAA/AM-94/16] p 31 N95-11702
Age 60 Rule research. Part 1: Bibliographic database
[DOT/FAA/AM-94/20-PT-1] p 35 N95-13019
Age 60 Rule. Part 2: Airline pilot age and performance. A review of the scientific literature
[DOT/FAA/AM-94/21-PT-2] p 35 N95-13020

E

- Edgewood Arsenal, Aberdeen Proving Ground, MD.**
Comparison of submaximal cycling and treadmill exercise at similar work rates
[AD-A283430] p 33 N95-12593
- Edgewood Research Development and Engineering Center, Aberdeen Proving Ground, MD.**
Acute inhalation of explosively disseminated carbon fibers in rats
[AD-A280556] p 29 N95-12614
- Emory Univ., Atlanta, GA.**
Effect of decreased gravity on circulation in the rat
[NASA-CR-196946] p 29 N95-12827
- European Office of Aerospace Research and Development, FPO New York, NY.**
Effects of Noise on Hearing 5th International Symposium
[AD-A281439] p 33 N95-13177

F

- Federal Aviation Administration, Oklahoma City, OK.**
Simultaneous gas-chromatographic determination of four toxic gases generally present in combustion atmospheres
[DOT/FAA/AM-94/18] p 38 N95-12354
- Food and Agrosystems, Inc., Sunnyvale, CA.**
Methodologies for processing plant material into acceptable food on a small scale
[NASA-CR-177647] p 38 N95-12132

G

- Georgia Inst. of Tech., Atlanta, GA.**
Search for extraterrestrial intelligence/High Resolution Microwave Survey team member
[NASA-CR-196478] p 39 N95-13026
- Georgia Tech Research Inst., Atlanta, GA.**
Evaluation of candidate millimeter wave sensors for synthetic vision
p 39 N95-13214

H

- Hilton Systems, Inc., Cherry Hill, NJ.**
Age 60 Rule research. Part 1: Bibliographic database
[DOT/FAA/AM-94/20-PT-1] p 35 N95-13019
Age 60 study. Part 4: Experimental evaluation of pilot performance
[REPT-8025-4B] p 35 N95-13199

I

- Inhalation Toxicology Research Inst., Albuquerque, NM.**
Consequences of prolonged inhalation of ozone on Fischer-344/N rats: Collaborative studies. Part 1: Content and cross-linking of lung collagen
[PB94-182748] p 30 N95-13176

J

- Johns Hopkins Univ., Baltimore, MD.**
Visual psychophysics of egomotion
[AD-A282547] p 35 N95-12495

- Joint Publications Research Service, Arlington, VA.**
JPRS report: Science and technology. Central Eurasia: Life sciences
[JPRS-ULS-93-012] p 31 N95-11744

L

- Louisville Univ., KY.**
Spaceflight and immune responses of Rhesus monkeys
[NASA-CR-196846] p 29 N95-12941
- Lovelace Biomedical and Environmental Research Inst., Albuquerque, NM.**
Consequences of prolonged inhalation of ozone on Fischer-344/N rats: Collaborative studies. Part 1: Content and cross-linking of lung collagen
[PB94-182748] p 30 N95-13176

M

- Marci (J. M.) Spectroscopic Society, Prague, Stredocesky (Czechoslovakia).**
Abstracts from the International Conference on Nuclear Analytical Methods in the Life Sciences
[DE94-621923] p 27 N95-11728
- Maryland Univ., College Park, MD.**
Coordinated action in 3-D space
[AD-A281284] p 35 N95-13375
- Massachusetts General Hospital, Boston, MA.**
Ultraslow laser pulse effects in ocular and related media: Laser-induced shock wave propagation and retinal damage
[AD-A282599] p 32 N95-12535
- Massachusetts Inst. of Tech., Cambridge.**
How are three-dimensional objects represented in the brain?
[AD-A282367] p 34 N95-11942
- Mount Sinai School of Medicine, New York, NY.**
Reduction of ocular counter-rolling by adaptation to space
[NASA-CR-196279] p 32 N95-12376

N

- National Academy of Sciences - National Research Council, Washington, DC.**
Meeting the nation's needs for biomedical and behavioral scientists
[LC-94-66477] p 28 N95-12310
- National Aeronautics and Space Administration, Washington, DC.**
Aerospace medicine and biology: A continuing bibliography with indexes (supplement 394)
[NASA-SP-7011(394)] p 34 N95-13230
- National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.**
Effects of oral glucose on exercise thermoregulation in men after water immersion
[NASA-TM-108825] p 28 N95-11810
Interviews with the Apollo lunar surface astronauts in support of planning for EVA systems design
[NASA-TM-108846] p 37 N95-11905
Techniques for optimal crop selection in a controlled ecological life support system
p 37 N95-11962
Training for life science experiments in space at the NASA Ames Research Center
p 37 N95-11964
On the isolation of halophilic microorganisms from salt deposits of great geological age
p 28 N95-11966
Meeting the challenge of manned lunar and Martian exploration
p 37 N95-11970
Vestibular afferent responses to linear accelerations in the alert squirrel monkey
[NASA-TM-4581] p 28 N95-12006
Crew factors in flight operations 9: Effects of planned cockpit rest on crew performance and alertness in long-haul operations
[NASA-TM-108839] p 33 N95-12792

NASA. Johnson Space Center**National Aeronautics and Space Administration.****Lyndon B. Johnson Space Center, Houston, TX.**

Carbon dioxide and water vapor production at rest and during exercise. A report on data collection for the Crew and Thermal Systems Division

[NASA-TP-3500] p 36 N95-11811

Human factors assessments of the STS-57 SpaceHab-1 mission

[NASA-TM-104802] p 36 N95-11878

Evaluation of COSTAR mass handling characteristics in an environment. A simulation of the Hubble Space Telescope service mission

[NASA-TP-3489] p 32 N95-11887

National Defence Research Establishment, Stockholm (Sweden).

Tank crew performance related to cognitive ability and motivation of the tank crew members

[PB94-190642] p 34 N95-11872

Visit to UDRI and USAF, Armstrong Lab., Williams AFB, Phoenix, USA, February 8-11, 1993

[PB94-190659] p 36 N95-11873

National Inst. of Standards and Technology,**Gaithersburg, MD.**

Body dimensions for apparel

[PB94-187739] p 37 N95-11908

New England Deaconess Hospital, Boston, MA.

Morphological differentiation of colon carcinoma cell lines in rotating wall vessels

[NASA-CR-196780] p 31 N95-11808

Newcastle-upon-Tyne Univ., Newcastle (England).

Scene analysis: A brief survey

[PB94-205085] p 36 N95-13433

O**Ohio State Univ., Columbus.**

Regulation of alternative CO₂ fixation pathways in prokaryotic and eukaryotic photosynthetic organisms

[DE94-013180] p 30 N95-13271

P**Pacific Northwest Lab., Richland, WA.**

Rational enzyme redesign

[DE94-014565] p 29 N95-12677

Polish Academy of Sciences, Warsaw (Poland).

A numerical analysis of the distribution of stresses in lung parenchyma which accounts for the interactions between the tissue skeleton and flowing air

p 31 N95-11806

Prague Agricultural Univ., Prague, Stredocesky (Czechoslovakia).

Abstracts from the International Conference on Nuclear Analytical Methods in the Life Sciences

[DE94-621923] p 27 N95-11728

Puerto Rico Univ., San Juan.

Neural networks: Structure and repair. Part 1: Ground squirrel visual system. Part 2: Formation, maintenance and plasticity of synaptic connections

[AD-A282420] p 29 N95-12393

R**Rensselaer Polytechnic Inst., Troy, NY.**

Microbial communities in subsurface environments: Diversity, origin, and evolution

[DE94-013699] p 27 N95-11737

Rome Lab., Griffiss AFB, NY.

Radiofrequency/microwave radiation biological effects and safety standards: A review

[AD-A282886] p 33 N95-12919

S**Shock Society, Augusta, GA.**

Summary of the Sixteenth Annual Conference on Shock

[AD-A282643] p 32 N95-12542

T**Technische Univ., Delft (Netherlands).**

Design issues of human operator support systems

[PB94-191376] p 36 N95-11778

Copper metabolism in rats fed ascorbic acid or restricted amounts of copper

[PB94-191343] p 28 N95-11902

Modelling of biopotential recordings and its implications for instrumentation design

[PB94-206844] p 30 N95-13408

Texas Univ., Austin, TX.

Preconditioning electromyographic data for an upper extremity model using neural networks

[NASA-CR-196877] p 31 N95-11708

A musculoskeletal model of the elbow joint complex

[NASA-CR-195812] p 34 N95-13270

U**Universities Space Research Association, Columbia, MD.**

M.E.366-J embodiment design project: Portable foot restraint

[NASA-CR-197163] p 38 N95-12361

The embodiment design of the heat rejection system for the portable life support system

[NASA-CR-197178] p 38 N95-12555

Integral habitat transport system

[NASA-CR-197156] p 38 N95-12629

W**Wisconsin Univ., Madison, WI.**

Growth of potatoes for CELSS

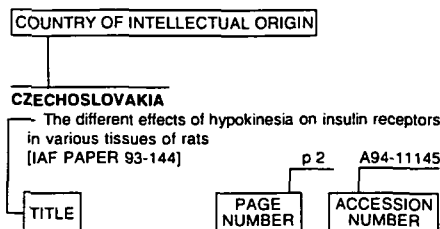
[NASA-CR-177646] p 37 N95-11949

FOREIGN TECHNOLOGY INDEX

AEROSPACE MEDICINE AND BIOLOGY / A Continuing Bibliography (Supplement 398)

February 1995

Typical Foreign Technology Index Listing



Listings in this index are arranged alphabetically by country of intellectual origin. The title of the document is used to provide a brief description of the subject matter. The page number and accession number are included in each entry to assist the user in locating the abstract in the abstract section. If applicable, a report number is also included as an aid in identifying the document.

R

RUSSIA

JPRS report: Science and technology. Central Eurasia: Life sciences
[JPRS-ULS-93-012] p 31 N95-11744

S

SWEDEN

Tank crew performance related to cognitive ability and motivation of the tank crew members
[PB94-190642] p 34 N95-11872
Visit to UDRI and USAF, Armstrong Lab., Williams AFB, Phoenix, USA, February 8-11, 1993
[PB94-190659] p 36 N95-11873

U

UNITED KINGDOM

Scene analysis: A brief survey
[PB94-205085] p 36 N95-13433

C

CHINA

Mammalian cell cultivation in space
p 27 A95-61564

CZECHOSLOVAKIA

Abstracts from the International Conference on Nuclear Analytical Methods in the Life Sciences
[DE94-621923] p 27 N95-11728

F

FRANCE

Psychophysiological assessment methods (including a register of psychophysiologicalists on microfiches)
[AGARD-AR-324] p 34 N95-12133

N

NETHERLANDS

Design issues of human operator support systems
[PB94-191376] p 36 N95-11778
Copper metabolism in rats fed ascorbic acid or restricted amounts of copper
[PB94-191343] p 28 N95-11902
Modelling of biopotential recordings and its implications for instrumentation design
[PB94-206844] p 30 N95-13408

P

POLAND

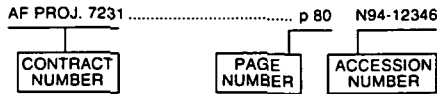
A numerical analysis of the distribution of stresses in lung parenchyma which accounts for the interactions between the tissue skeleton and flowing air
p 31 N95-11806

CONTRACT NUMBER INDEX

AEROSPACE MEDICINE AND BIOLOGY / A Continuing Bibliography (Supplement 398)

February 1995

Typical Contract Number Index Listing



Listings in this index are arranged alphanumerically by contract number. Under each contract number the accession numbers denoting documents that have been produced as a result of research done under the contract are shown. The accession number denotes the number by which the citation is identified in the abstract section. Preceding the accession number is the page number on which the citation may be found.

AF PROJ. 4506	p 33	N95-12919
AF-AFOSR-0124-91	p 35	N95-13375
AF-AFOSR-0154-91	p 35	N95-12495
DA PROJ. 1C4-63627-DE-79	p 29	N95-12614
DA PROJ. 101-62622-A-553	p 33	N95-12593
DA PROJ. 301-62787-A-878	p 33	N95-13054
	p 39	N95-13055
DAAH04-93-G-0007	p 30	N95-13373
DE-AC06-76RL-01830	p 29	N95-12677
DE-FG02-90ER-60989	p 27	N95-11737
DE-FG02-91ER-20033	p 30	N95-13271
DTFA02-90-C-90125	p 35	N95-13019
	p 35	N95-13020
	p 35	N95-13199
FAA TASK AM-A-91-HRR-138	p 35	N95-13020
FAA TASK AM-A-94-HRR-138	p 35	N95-13019
F49620-93-1-0290	p 32	N95-12535
NAG2-573	p 32	N95-12376
NAG2-624	p 29	N95-12941
NAG2-700	p 39	N95-13026
NAG2-703	p 32	N95-12376
NAG2-87	p 29	N95-12827
NAG9-520	p 31	N95-11808
NAG9-588	p 34	N95-13270
NASA ORDER H-22787-D	p 30	N95-13423
NASW-4435	p 38	N95-12361
	p 38	N95-12555
	p 38	N95-12629
NAS2-13404	p 38	N95-12132
NAS9-17900	p 36	N95-11878
NAS9-18773	p 31	N95-11708
NAS9-18800	p 36	N95-11878
NCC2-301	p 37	N95-11949
N00014-89-J-3070	p 29	N95-12393
N00014-92-J-1879	p 34	N95-11942
N00014-93-1-0385	p 34	N95-11942
N00014-93-1-0951	p 32	N95-12542
RFA-90-1	p 30	N95-13176
RTOP 199-06-12	p 37	N95-11905
RTOP 199-16-12	p 28	N95-12006
RTOP 199-18-12-07	p 28	N95-11810
RTOP 505-64-53	p 33	N95-12792
SBIR-12.04-8450B	p 38	N95-12132

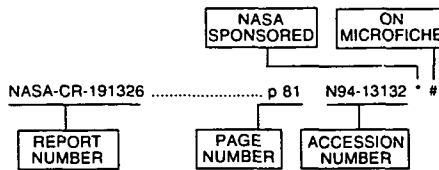
CONTRACT

REPORT NUMBER INDEX

AEROSPACE MEDICINE AND BIOLOGY / A Continuing Bibliography (Supplement 398)

February 1995

Typical Report Number Index Listing



Listings in this index are arranged alphanumerically by report number. The page number indicates the page on which the citation is located. The accession number denotes the number by which the citation is identified. An asterisk (*) indicates that the item is a NASA report. A pound sign (#) indicates that the item is available on microfiche.

A-94058	p 28	N95-12006 * #
A-94085	p 28	N95-11810 * #
A-94129	p 37	N95-11949 * #
A-94130	p 38	N95-12132 * #
A-94131	p 37	N95-11905 * #
A-94134	p 33	N95-12792 * #
AD-A280556	p 29	N95-12614
AD-A281282	p 30	N95-13373 #
AD-A281284	p 35	N95-13375 #
AD-A281439	p 33	N95-13177
AD-A282221	p 32	N95-12405 #
AD-A282222	p 32	N95-12406 #
AD-A282367	p 34	N95-11942
AD-A282420	p 29	N95-12393 #
AD-A282547	p 35	N95-12495 #
AD-A282599	p 32	N95-12535
AD-A282643	p 32	N95-12542
AD-A282886	p 33	N95-12919
AD-A283064	p 33	N95-13054
AD-A283065	p 39	N95-13055
AD-A283430	p 33	N95-12593
AFOSR-94-0401TR	p 35	N95-13375 #
AFOSR-94-0450TR	p 35	N95-12495 #
AFOSR-94-0464TR	p 32	N95-12535
AGARD-AR-324	p 34	N95-12133 #
AI-M-1479	p 34	N95-11942
ARO-29714.1-LS	p 30	N95-13373 #
BTN-94-EIX94341340323	p 27	A95-60859
BTN-94-EIX94341340324	p 27	A95-60860
BTN-94-EIX94341340325	p 27	A95-60861
CONF-930954	p 27	N95-11728 #
CONF-9405190-1	p 29	N95-12677 #
DE94-013180	p 30	N95-13271 #
DE94-013699	p 27	N95-11737 #
DE94-014565	p 29	N95-12677 #
DE94-621923	p 27	N95-11728 #
DOE/ER-20033/2	p 30	N95-13271 #
DOE/ER-60989/4	p 27	N95-11737 #
DOT/FAA/AM-94/16	p 31	N95-11702 #
DOT/FAA/AM-94/18	p 38	N95-12354 #
DOT/FAA/AM-94/20-PT-1	p 35	N95-13019 #
DOT/FAA/AM-94/21-PT-2	p 35	N95-13020 #
DOT/FAA/AM-94/23	p 35	N95-13199 #
DOT/FAA/92/24	p 33	N95-12792 * #

ERDEC-TR-084	p 29	N95-12614
ERDEC-TR-175	p 33	N95-12593
FOA-A-50020-5.2	p 36	N95-11873
FOA-C-50103-5.3	p 34	N95-11872
HEI/RR-65-1/94-PT-1	p 30	N95-13176 #
INIS-MF-13811	p 27	N95-11728 #
ISBN-0-309-05086-3	p 28	N95-12310
ISBN-90-370-0090-8	p 36	N95-11778 #
ISBN-90-73861-18-7	p 28	N95-11902 #
ISBN-92-835-0747-9	p 34	N95-12133 #
JPRS-ULS-93-012	p 31	N95-11744 #
LC-94-66477	p 28	N95-12310
MSFC-1	p 30	N95-13423 * #
NAS 1.15:104802	p 36	N95-11878 * #
NAS 1.15:108825	p 28	N95-11810 * #
NAS 1.15:108839	p 33	N95-12792 * #
NAS 1.15:108846	p 37	N95-11905 * #
NAS 1.15:4581	p 28	N95-12006 * #
NAS 1.21:7011(394)	p 34	N95-13230 *
NAS 1.26:177646	p 37	N95-11949 * #
NAS 1.26:177647	p 38	N95-12132 * #
NAS 1.26:195812	p 34	N95-13270 * #
NAS 1.26:196279	p 32	N95-12376 * #
NAS 1.26:196478	p 39	N95-13026 * #
NAS 1.26:196780	p 31	N95-11808 * #
NAS 1.26:196846	p 29	N95-12941 * #
NAS 1.26:196848	p 30	N95-13423 * #
NAS 1.26:196877	p 31	N95-11708 * #
NAS 1.26:196946	p 29	N95-12827 * #
NAS 1.26:197156	p 38	N95-12629 * #
NAS 1.26:197163	p 38	N95-12361 * #
NAS 1.26:197178	p 38	N95-12555 * #
NAS 1.60:3489	p 32	N95-11887 * #
NAS 1.60:3500	p 36	N95-11811 * #
NASA-CR-177646	p 37	N95-11949 * #
NASA-CR-177647	p 38	N95-12132 * #
NASA-CR-195812	p 34	N95-13270 * #
NASA-CR-196279	p 32	N95-12376 * #
NASA-CR-196478	p 39	N95-13026 * #
NASA-CR-196780	p 31	N95-11808 * #
NASA-CR-196846	p 29	N95-12941 * #
NASA-CR-196848	p 30	N95-13423 * #
NASA-CR-196877	p 31	N95-11708 * #
NASA-CR-196946	p 29	N95-12827 * #
NASA-CR-197156	p 38	N95-12629 * #
NASA-CR-197163	p 38	N95-12361 * #
NASA-CR-197178	p 38	N95-12555 * #
NASA-SP-7011(394)	p 34	N95-13230 *
NASA-TM-104802	p 36	N95-11878 * #
NASA-TM-108825	p 28	N95-11810 * #
NASA-TM-108839	p 33	N95-12792 * #
NASA-TM-108846	p 37	N95-11905 * #
NASA-TM-4581	p 28	N95-12006 * #
NASA-TP-3489	p 32	N95-11887 * #
NASA-TP-3500	p 36	N95-11811 * #
NISTIR-5411	p 37	N95-11908 #
PB94-182748	p 30	N95-13176 #
PB94-187739	p 37	N95-11908 #
PB94-190642	p 34	N95-11872
PB94-190659	p 36	N95-11873
PB94-191343	p 28	N95-11902 #
PB94-191376	p 36	N95-11778 #
PB94-205085	p 36	N95-13433
PB94-206844	p 30	N95-13408 #
PNL-SA-24337	p 29	N95-12677 #
REPT-115-38-8515	p 31	N95-11808 * #
REPT-8025-1A-PT-2	p 35	N95-13020 #
REPT-8025-4B	p 35	N95-13199 #
RL-TR-94-53	p 33	N95-12919
S-775	p 32	N95-11887 * #
S-779	p 36	N95-11878 * #
S-781	p 36	N95-11811 * #
TRS-480	p 36	N95-13433
USAARL-94-22	p 32	N95-12406 #
USAARL-94-30	p 39	N95-13055
USAARL-94-31	p 33	N95-13054

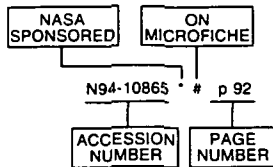
REPORT

ACCESSION NUMBER INDEX

AEROSPACE MEDICINE AND BIOLOGY / A Continuing Bibliography (Supplement 398)

February 1995

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A95-60859	p 27	N95-13176	#	p 30
A95-60860	p 27	N95-13177		p 33
A95-60861	p 27	N95-13199	#	p 35
A95-61564	p 27	N95-13214	* #	p 39
		N95-13230	*	p 34
		N95-13270	* #	p 34
N95-11702	# p 31	N95-13271	#	p 30
N95-11708	* # p 31	N95-13373	#	p 30
N95-11728	# p 27	N95-13375	#	p 35
N95-11737	# p 27	N95-13408	#	p 30
N95-11744	# p 31	N95-13423	* #	p 30
N95-11778	# p 36	N95-13433		p 36
N95-11806	# p 31			
N95-11808	* # p 31			
N95-11810	* # p 28			
N95-11811	* # p 36			
N95-11872	p 34			
N95-11873	p 36			
N95-11878	* # p 36			
N95-11887	* # p 32			
N95-11902	# p 28			
N95-11905	* # p 37			
N95-11908	# p 37			
N95-11942	p 34			
N95-11949	* # p 37			
N95-11962	* # p 37			
N95-11964	* # p 37			
N95-11966	* # p 28			
N95-11970	* # p 37			
N95-12006	* # p 28			
N95-12132	* # p 38			
N95-12133	# p 34			
N95-12310	p 28			
N95-12354	# p 38			
N95-12361	* # p 38			
N95-12376	* # p 32			
N95-12393	# p 29			
N95-12405	# p 32			
N95-12406	# p 32			
N95-12495	# p 35			
N95-12535	p 32			
N95-12542	p 32			
N95-12555	* # p 38			
N95-12593	p 33			
N95-12614	p 29			
N95-12629	* # p 38			
N95-12677	# p 29			
N95-12792	* # p 33			
N95-12827	* # p 29			
N95-12919	p 33			
N95-12941	* # p 29			
N95-13019	# p 35			
N95-13020	# p 35			
N95-13026	* # p 39			
N95-13054	p 33			
N95-13055	p 39			

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REPORT DOCUMENT PAGE

1. Report No. NASA SP-7011 (398)	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle Aerospace Medicine and Biology A Continuing Bibliography (Supplement 398)	5. Report Date February 1995		
	6. Performing Organization Code JTT		
7. Author(s)	8. Performing Organization Report No.		
9. Performing Organization Name and Address NASA Scientific and Technical Information Office	10. Work Unit No.		
	11. Contract or Grant No.		
12. Sponsoring Agency Name and Address National Aeronautics and Space Administration Washington, DC 20546-0001	13. Type of Report and Period Covered Special Publication		
	14. Sponsoring Agency Code		
15. Supplementary Notes			
16. Abstract This report lists 66 reports, articles and other documents recently announced in the NASA STI Database.			
17. Key Words (Suggested by Author(s)) Aerospace Medicine Bibliographies Biological Effects		18. Distribution Statement Unclassified - Unlimited Subject Category - 52	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 48	22. Price A03/HC

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